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Modern Metals

MARCH, 1961

BONDED EXTRUSIONS IMPROVE DESIGN OF STREET LIGHT POLES

Cost-cutting structural system to speed aluminum's penetration of the fast-growing replacement market for city light standards.
(see page 46)

ALSO IN THIS ISSUE

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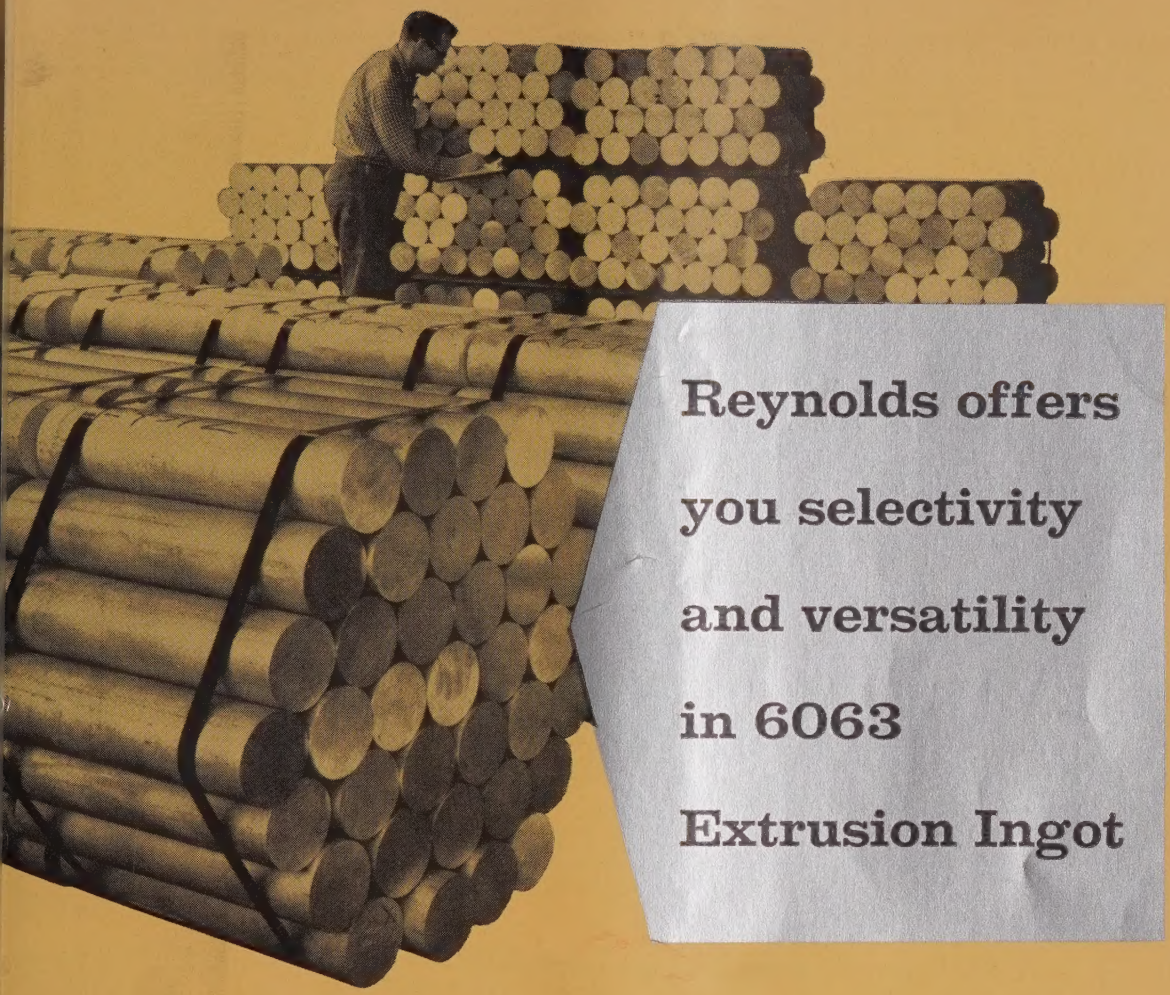

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ynolds offers refinements of 63 homogeneous ingot that are signed to increase extrusion ciency and product perform-ce. Availability of specifications *063* and *T6063* as modifications thin 6063 chemical limits fur-r adapt the "all purpose" oy to some of the specific prob-ns of the extruder.

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Question:

How thin can sections be made by casting aluminum?

Question:

What type lubricants are used for impact extruding of aluminum?

Answers

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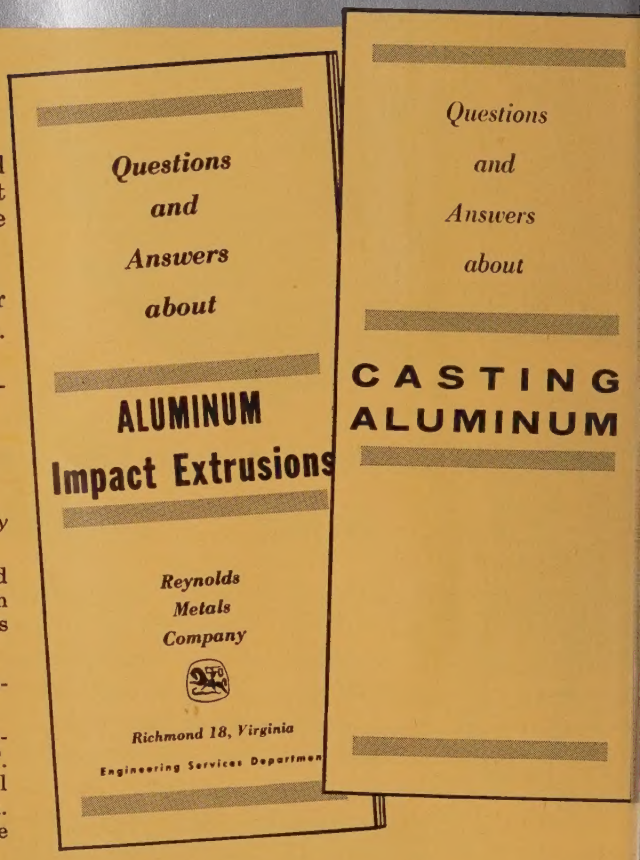
Q. *What type lubricants are used for impact extruding?*

A. Lubricants must have high film-strength and flash points from 500°F. up because of the high frictional heats generated during extrusion. Animal-fat base lubricants and some waxes have proven satisfactory.



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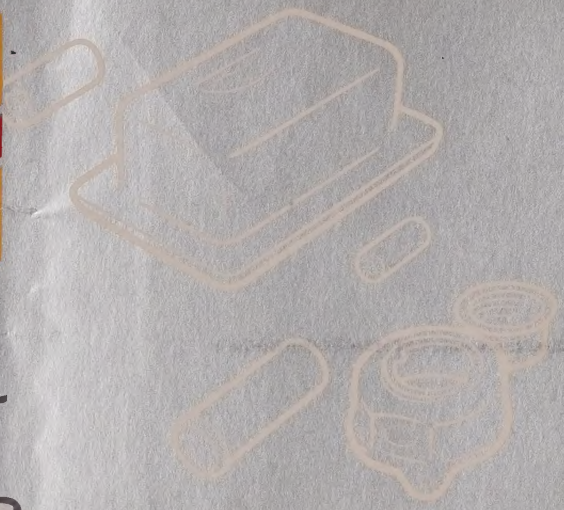

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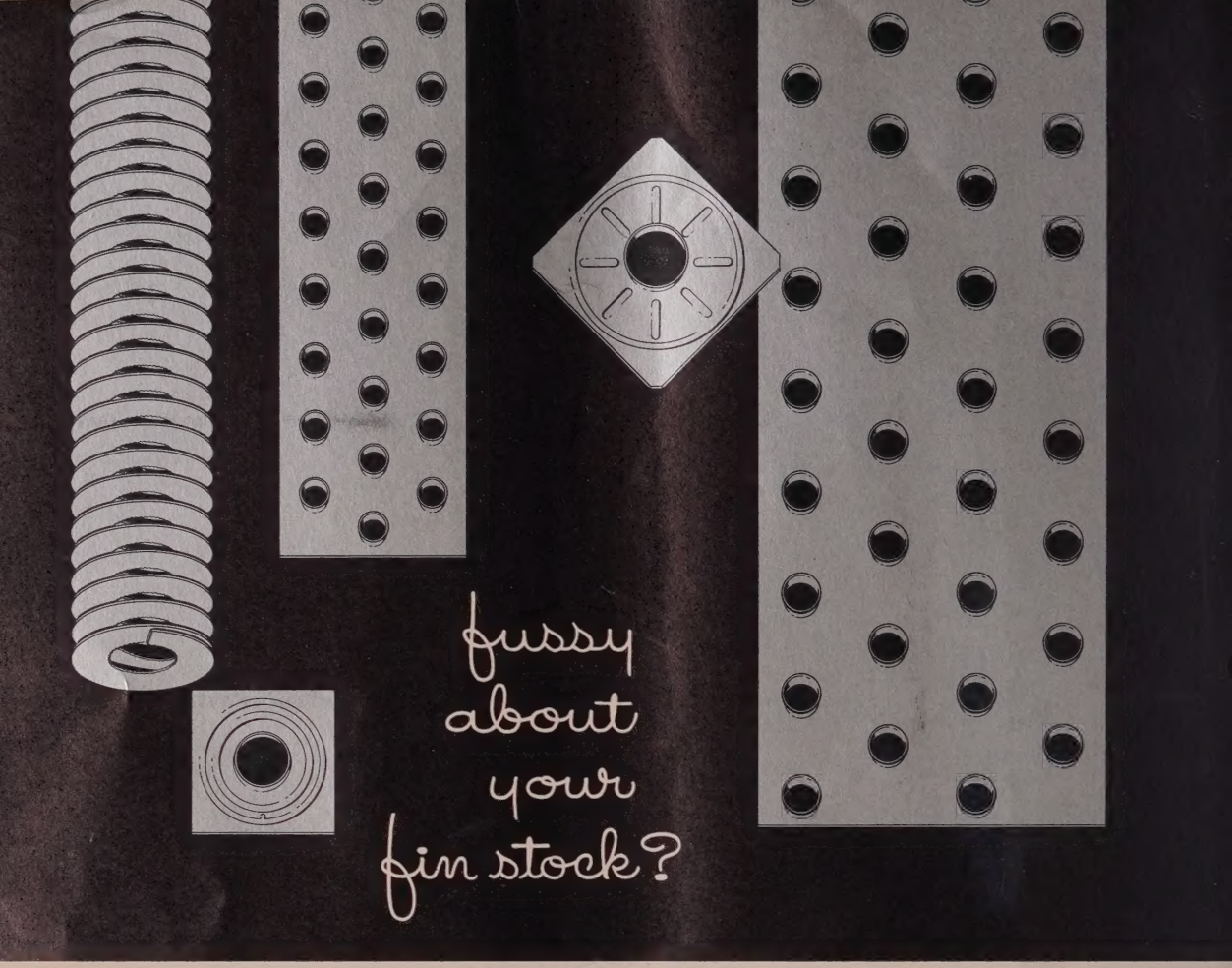

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MODERN METALS
Read in companies that produce, fabricate and cast aluminum, magnesium and titanium, and firms that use these metals in manufacturing end products.

THE COVER: This handsome alumi- street light standard made its Broad- debut in New York earlier this year. passes its tests chances are it will re- e 64,000 light standards that have done there since the turn of the century. ntless coats of paint cling to these old dards — something that the new multi- ose poles will never need. What is most rtant, however, is the method of bond- two extruded halves of the standard a powerful adhesive. The story be- on page 46.

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ASSISTANTS
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Modern Metals

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WELDING ALUMINUM (Conclusion) **32**
This final installment of our 11-part series details the effect of welding heat on the various alloys. Alloy selection and ways to compensate for loss of parent metal strength are covered.

TODAY'S EXTRUSION ECONOMICS ..... J. A. Logan **38**
What is needed to survive in the fiercely competitive extrusion market is modern equipment, says one equipment maker.

A NEW TYPE OF LONG-TERM LOAN ..... LeRoy L. Kohn **42**
Financier describes trend to a new development in financing, tailored for small firms who want to grow.

VERSATILE LIGHT POLES ..... J. P. Bush and J. A. Scott **46**
Modern Metals' cover story describes a modern designed light standard which makes effective use of solid extrusions joined with a strong epoxy adhesive. The prototype is now being tested.

TARIFFS — PRO AND CON **50**
U. S. Tariff Commission, preparing for GATT meeting in Switzerland, hears opposing views of Aluminium Limited and U. S. primary producers.

HOME BUILDERS BULLISH AS EVER ..... H. K. Darby **54**
Undismayed by a poor building year in 1960, the nation's home builders are taking steps to "hypo" the American public, influence their spending in favor of new homes.

FASTENING ALUMINUM (Part 3) ..... F. L. Church **62**
This installment of Modern Metals' 4-part feature gives full details on how to specify and use standard threaded fasteners. Power tools for driving fasteners are also described.

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If your business requires **shapes-by-the-mile** you may very likely find it more convenient and economical to **roll your own!** MICHIGAN ROLL FORM equipment: form rolls, rolling machines, notching dies, cut-off machines and dies . . . add up to give you an **all-in-one** automatic, production-line operation. For full particulars, address your inquiry to the Engineering Dept. of:

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Letters

Housewares Show

Sirs:

Was very interested to read in the February issue of the swing among so-called "housewares" manufacturers to aluminum. Your survey of the Housewares Show was very enlightening as regards the wide variety of manufacturers who now use aluminum.

If you have an extra copy, sure could use one. . .

"M"—Pennsylvania

MM—Our quick survey revealed that of the 600-odd exhibitors somewhere between 33 and 50% now use substantially more aluminum than they did two years ago.

Wants Cement for Joining Aluminum and Glass

Sirs:

We will appreciate receiving information you may be able to forward covering sources of supply for a waterproof, watertight cement for fastening aluminum to aluminum and glass to aluminum.

We are particularly interested in a cement which could be used at room temperature with no, or a minimum amount of pressure.

"J"—Florida

MM—We know there are several firms that supply this type of cement—but we can't recall their names. If any reader can help "J" (and us), we'll sure be grateful.

"Fastening Aluminum" Will Be Reprinted

Sirs:

Your first two installments on "How to Fasten Aluminum" which appeared in January and February are by far the best I've ever read on the subject. I look forward to the subsequent parts.

If you plan to reprint them, please enter my order for two copies.

"W"—Ohio

MM—For those who missed the first two sections, Part 1 included results of a Modern Metals survey of light metals firms that use fasteners; comparison of joining methods; and selection and heat treatment of fastener alloys. Part 2 dealt with riveting and stitching. Part 3, which starts on page 62 of this issue details selection and use of standard threaded fasteners, plus the tools used in assembly. Next month we will cover special fasteners, including case histories showing actual usage in light metals products.

In April we'll wrap all four parts into a 36-page reprint. You can order copies now by using the order form on page 98.

Magnesium Sales In Red China

Sirs:

We note in your February issue under "Looking Ahead" that we are credited with the sale of some $2,000,000 worth of magnesium to Red China. In point of fact our sales to that country amounted only to about one-tenth of that figure. We welcomed this business at the time, but we would much prefer a more liberal tariff structure that would have enabled us to have sold the same quantity in the United States.

It would appear that you have either mistaken a decimal or that you have us

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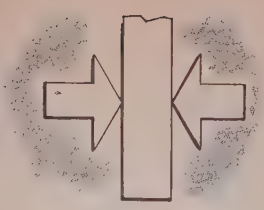

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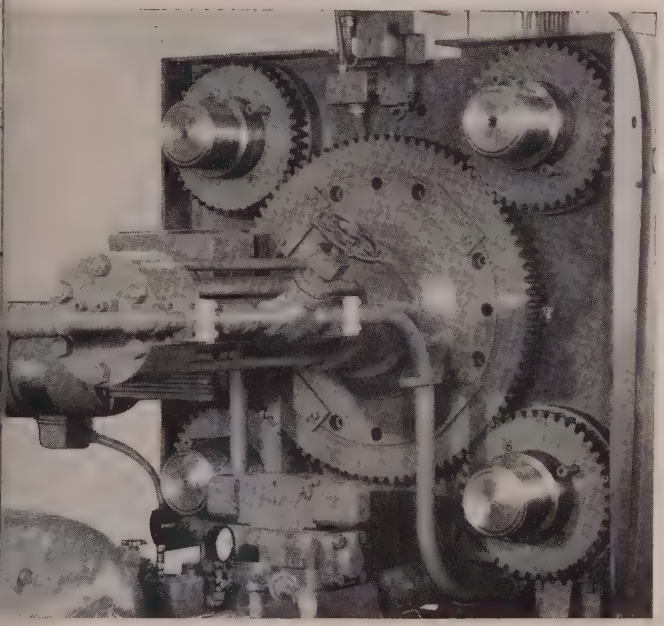

At the touch of a button you can now get die height adjustment for set-up and tonnage control. The Greenlee-B & T system uses a gear-head electric motor to drive a large bull gear which in turn drives a pinion gear on each tie bar nut.

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(4) accessibility of hydraulic ejector mechanism.

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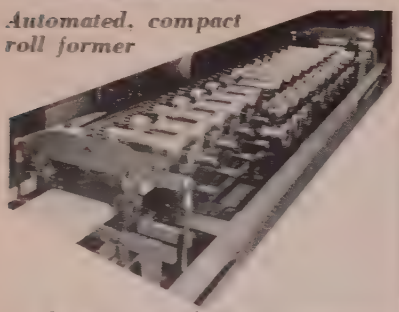

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Box 366

MODERN METALS

435 North Michigan Avenue
Chicago 11, Illinois

How To Clean & Finish Aluminum

To get your copy of this 36-page manual use order form on page 92

confused with a supplier of one of the heavier metals.

"H"—Ontario

MM—You're right! Somebody added an additional zero. Furthermore, we learn that Red China isn't, as yet, a very big user of magnesium; that they need technical help.

In the same item we stated that Germany's Bitterfeld plant hopes to produce 7000 tons of magnesium by 1965. We should have included the fact that this plant is in East Germany.

And finally, in case anyone misinterpreted our reference to Norway's magnesium industry, its government-controlled plant has been the largest supplier to Germany's Volkswagen auto plant since it was rehabilitated in 1952.

Welding Aluminum Can Be Intricate

Sirs:

We flash weld aluminum windows but as yet have not developed a satisfactory method of smoothing-off the corner of the exposed surface. As you know, an architect requires the very best of finishes.

Perhaps you or one of your readers would make a suggestion. . . .

"W"—British Columbia

MM—We have forwarded your letter to an expert in your area.

You may also get details, from our eleven-part manual on welding aluminum (final installment in this issue) which covers the subject pretty thoroughly. Reprints are now being made. If you fill in the coupon on page 96, we'll send you one (no charge).

Marine Hardware

Sirs:

The November issue contained an article on marine hardware made of aluminum by Evans Marine Equipment Company of Chicago.

I would like to contact this firm to suggest the possible use of porcelain enamel finishes on their products. If you have the street address of this firm, I would appreciate receiving that information.

"J"—Tennessee

MM—They're in the phone book and doing business at 3737 West Cortland.

Aluminum Siding

Sirs:

The aluminum siding article is undoubtedly one of the very best and most complete that I have ever seen covering an industry product. I would like to have 20 reprints. Please bill me if there is any charge.

"R"—Indiana

MM—This is a subject of wide interest because we've been cleaned out of January issues for weeks.

We reprinted the article; will send copies as long as they last.

Wood Seats Wear Out

Sirs:

The wooden bench-type seats in our municipal stadium are about worn out. We are trying to find out if there isn't some material other than wood which might be used for seats. Have you ever heard of aluminum seats being used in a stadium? If so, I would like more details about it and what the cost would run per foot.

"B"—Georgia

MM—Several firms make aluminum stadium and institutional seating. One of the biggest is American Seating Co., 901 Broadway, Grand Rapids 2, Mich. They will be glad to help you.

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Nonferrous metals and alloys. Experience in industrial relations, materials handling, furnace operation — gas and electric. Must be cost conscious. 65-year old firm with modern plant. Salary open. Write giving full details to:

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Lots of new business from light metals fabricators and product manufacturers is obtained through half-column advertisements like this one.

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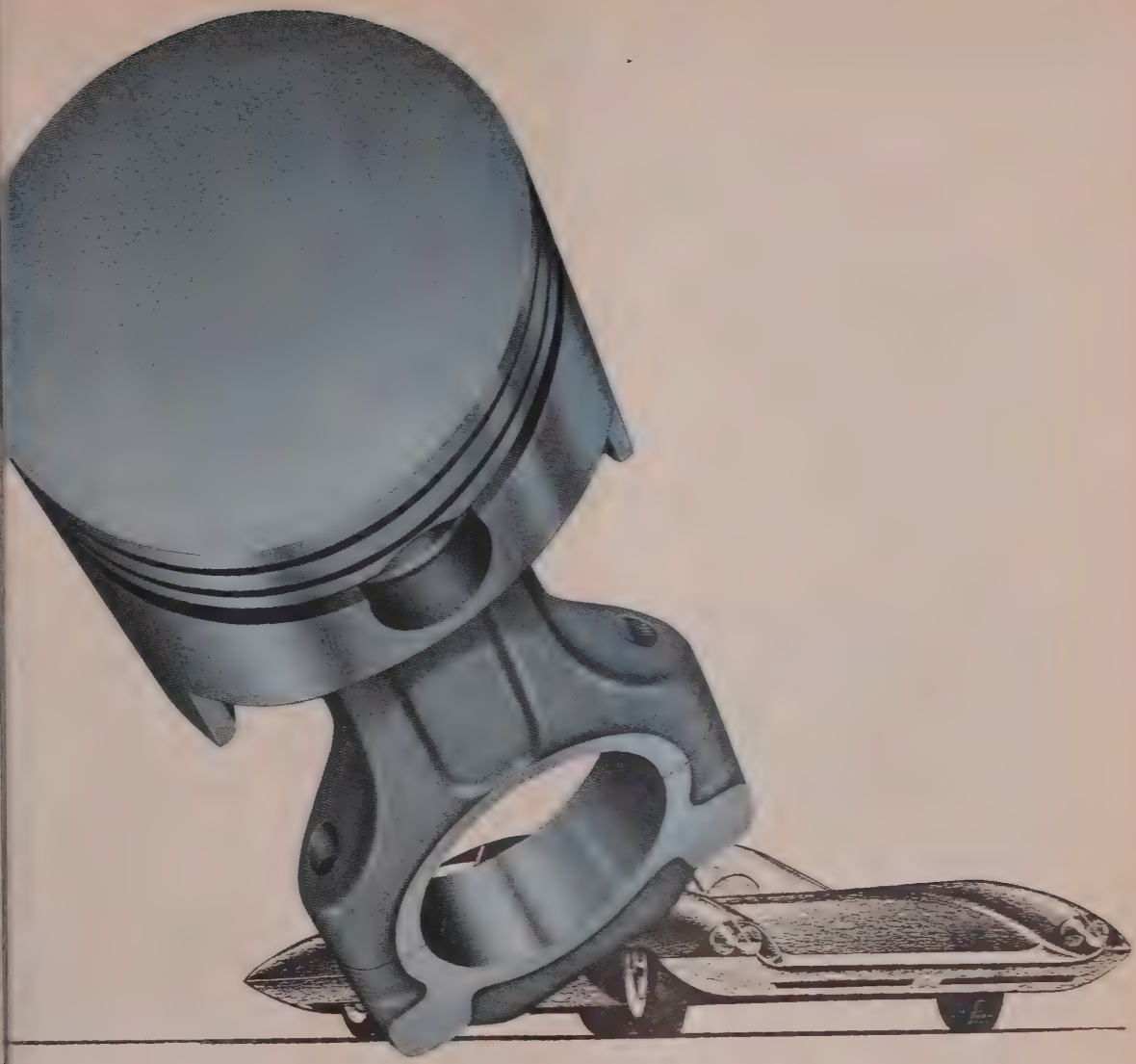

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Aluminum can take it, in automobile engines or space vehicles. Through metal research and product development, Harvey Aluminum has made this tough metal tougher: *in forged pistons, connecting rods, clutch assemblies, and other rugged parts.*

At Harvey Aluminum, you'll find men of imagination. Use this source of technical knowledge to better the products you make. Odds are that you'll lower your manufacturing costs, improve design, or upgrade your quality.

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by General Bronz

Top Window Producer and World's Largest Home Manufacturer Team up in Major Breakthrough —Painted Aluminum Windows . . . Alodine-Treated For Years of Maintenance-Free Service!

Advanced flash welding techniques give General Bronze products greater weld strength and water-tightness.

An Alwintite picture window frames Alodine 1200S spray-booth ec at General Bronze Corporation's Alwintite Division, as conveyor-hung are Alodized.

Finished windows are loaded into freight car for shipment to National Homes from plant railroad siding. General Bronze supplies all painted aluminum windows for the home manufacturer's "Viking" line.

General Bronze executives examine samples of Alodized aluminum sections. Left to right: Works Manager, G. M. Keulemans; Gener intendent, George Pruessner; and Purchasing Agent, Harold Heitzm

ainted Aluminum Windows
or National Homes!

itects, developers and home manufacturers are ıg development of painted aluminum windows major improvement that's been made since the ›tion of that type of window." Indications that ked-on, properly applied acrylic lacquer will ide 12 to 15 years life on aluminum windows opened new horizons for the product.

When General Bronze decided to create this new ”—a baked enamel finish on aluminum windows r the world's largest home manufacturer, ›nal Homes, it called on Amchem to come up the proper treatment and coating prior to ing and baking. The answer—a fully conveyor- and automated Alodine 1200S pre-paint spray m. The results—since Alodine was first intro- d—a superior, durable finish that prevents paint e, a reject record of zero and not a single mer complaint!

A team effort between Purchasing, Production Management triggered General Bronze's decision ecify Alodine for their vital production roles in lying all painted aluminum windows for National es 1960 line. General Bronze had created an stry standard for excellence when it pioneered se of Amchem's Aluminum Etchant to produce ecial luster-dip effect where aluminum finishes specified in its line. The constant uniformity ease of control obtained with this process in- ced General Bronze's decision to use the extra guarding qualities of Alodine in creating this r new home building development. National es' widespread use of line on all aluminum se exteriors in their ing" line was also a r factor.

Amchem's special technical advisory service was put into action to help expedite the installation of General Bronze's highly efficient pre-paint finishing system. Amchem engineers collaborated with the equipment builder to provide a virtually custom-designed system. Development Laboratory testing and pilot plant processing continue at Amchem headquarters in the search for even more efficient chemicals for a higher quality end product. On personal service, one General Bronze official says: "It's not uncommon for us to run into a problem, call their representative at 8 o'clock in the morning and have them down here at 9."

With a capacity of 6,000 windows per day at their North Dighton, Mass. plant (dedicated solely to production of residential windows and sliding doors), General Bronze plans to use its Alodizing operation 24-hours a day to provide trouble-free operation during peak periods. General Bronze is confident that the Amchem products it uses will enable this company to maintain consistently uniform results in line with its highest standards of design and workmanship on all types of finishes on all General Bronze products.

Customer acceptance of a painted aluminum window that will blend with home decor and comes as a finished product (does not require painting in the field) lends further scope to this upcoming market. With exciting potentialities in store for painted aluminum windows, General Bronze now considers the possibility of extending Alodine usage to other products — painted aluminum storm windows and sliding doors.

Do you have—a product? a problem? a use for Alodine? Call or write for further details!

Alodized and painted aluminum windows by General Bronze are featured in 1960 National Homes line. Other aluminum portions of National Home models are Alodine-treated for beauty, protection and long life.

Send for Booklet 1424A describing uses of Alodine, the standard pre-paint and protective treatment for aluminum.

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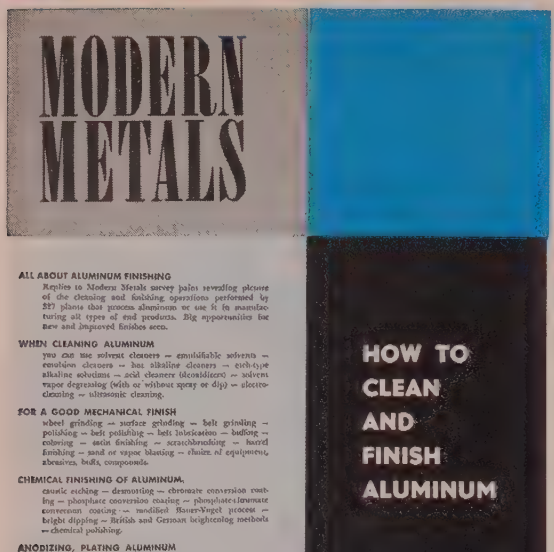
all about aluminum finishing


MODERN METALS
ALL ABOUT ALUMINUM FINISHING
Replies to Modern Metals survey paint revealing pleasure of the cleaning and finishing operations performed by 287 plants that process aluminum or use it in manufacturing all types of end products. Big opportunities for new and improved finishes seen.
WHEN CLEANING ALUMINUM
you can use solvent cleaners — emulsifiable solvents — emulsion cleaners — hot alkaline cleaners — etch-type alkaline solutions — acid cleaners (deoxidizers) — solvent vapor degreasing (with or without spray or dip) — electrocleaning — ultrasonic cleaning.
FOR A GOOD MECHANICAL FINISH
wheel grinding — surface grinding — belt grinding — polishing — belt polishing — belt lubrication — buffing — coloring — satin finishing — scratchbrushing — barrel finishing — sand or vapor blasting — finishing equipment, abrasives, belts, compounds.
CHEMICAL FINISHING OF ALUMINUM.
caustic etching — desmutting — chromate conversion coating — phosphate conversion coating — phosphate-fluoride conversion coating — modified Bauer-Vogel process — bright dipping — British and German brightening methods — chemical polishing.
ANODIZING, PLATING ALUMINUM
pretreatments — electrolytes — coating characteristics — operating conditions — racks — coloring — sealing — hard coating — build-up tables — electroplating — special considerations — plating metals — electropolishing processes.
ORGANIC COATINGS FOR ALUMINUM
cleaning methods — surface pretreatments — primers — etch type primers — types of finish coats — spray painting — hot airless spraying — airless electrostatic spraying — steam spraying — roller coating — dip painting — flow coating — baking — drying.
PORCELAIN ENAMELING ALUMINUM
Design Considerations — Pretreatment — Frits — Enameling Practice — Color Applications — New Developments
HOW TO CLEAN AND FINISH ALUMINUM
Reprinted from MODERN METALS 422 S. Michigan Ave. Chicago 11, Ill. September 1959

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1-61

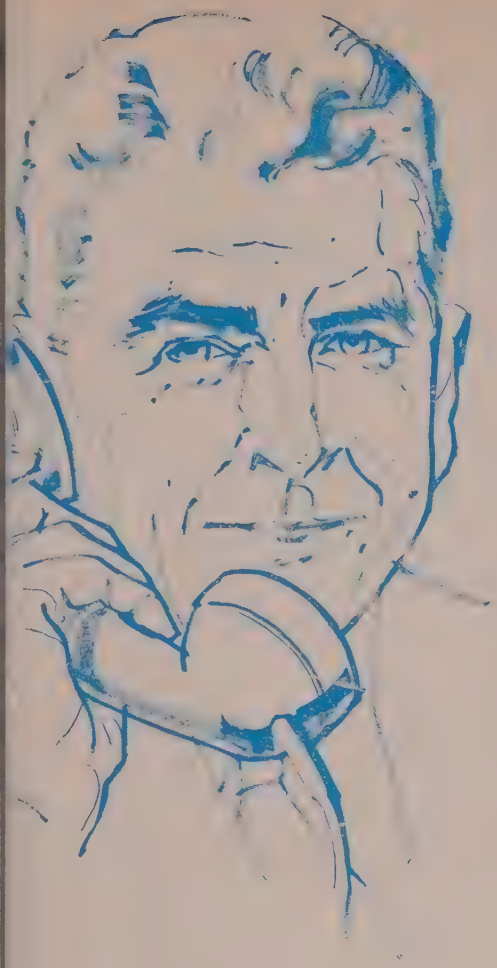
Here and There

Tough Competition » » Here's a warning for aluminum building products industry from a executive in this field. Right after the National Asso tion of Home Builders Show he said: "Don't und estimate the power of the wood siding people. T looked very strong at the NAHB Show where t seem to have done an outstanding merchandising jo This executive pointed out that every wood produ booth was an attractive display which had strong peal for the builders. Aluminum siding and wind booths suffered by comparison, he said. There w more wood siding exhibitors than aluminum (12 to almost as many asbestos siding outfits as aluminu We agree with the aluminum man; the extra eff of the wood people at the show was most apparent.

Alside Acceptance Ready to Go » » Word fr Alside, Inc., Akron, Ohio, is that Alside Accepta Corp., has been formed and will begin immediat to purchase installment contracts from Alside r dential siding dealers. The world's largest sid manufacturer has a $6 million loan from the Jo Hancock Insurance Co., has the right to incur a to indebtedness of up to $40 million for consumer cre operations. Alside President Jerome J. Kaufman, Modern Metals' 1960 Man of the Year.

Big Savings for Juice Packers « « Having their bread upon the waters, frozen juice packers now watching it come back to them — buttered. F nolds Metals Co. reported freight savings this sea of $594,000, brought about by the use of alumin instead of tinned steel in frozen juice cans. The figu thoughtfully released by Reynolds as the National sociation of Frozen Food Packers began its ann convention in Dallas, compare the difference in fre rates between aluminum and standard tinplate. savings figures are based on Reynolds' estimates 250,000,000 all-aluminum cans and 500,000,000 aluminum bodies and tinplate ends are being pac in Florida during the current citrus season. the six-ounce size is included. Complete industry version to aluminum would reap freight saving $1,250,000 for the season's estimated one and a qua billion six-ounce containers. Thin tinplate helps somewhat, but aluminum is still way out front.

Metal Fasteners Stay on Top « « Competi in the fastener field is stiff, but metal screws are ported to be holding their own. If a sluggish industry is buying fewer screws and bolts, a boor electronics business is taking up the slack (this ind expects sales to top $10 billion in 1961). Accor to Orin B. Werntz, executive vice president of National Screw Machine Products Association, n screws are used by more than 70 industries. More $433 million worth of screw machine products shipped in 1958, compared with $406.5 millio 1954. The business slipped somewhat from a 19 norm, but if Modern Metals' survey of fastener is any indication, fastener manufacturers woul



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WOLVERINE TUBE . . . manufacturers of quality ed seamless drawn and extruded aluminum tube.

been in business since 1916. We are tubing specialists— our entire facilities and energies to the production of one —the very finest of tubing. Our customers are found r quality tubing is used, and we're proud of our com- bing line and our reputation for product excellence and integrity.

t to sell *you* tubing made the TUBEMANSHIP way.

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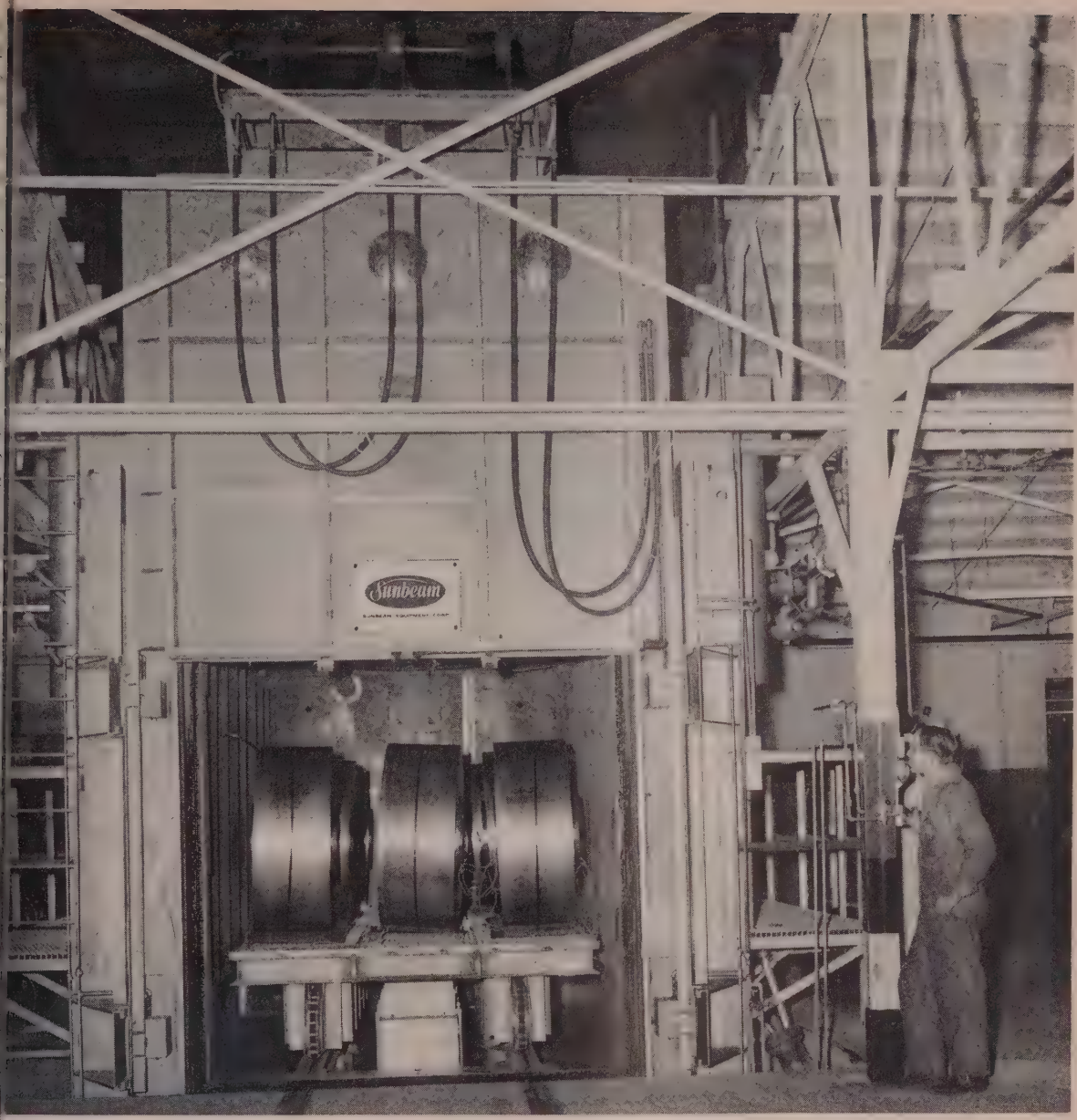
well to woo the aluminum products industries. The third installment of our series of articles on fastening aluminum (it begins on page 62 of this issue) tells how to use standard screws, bolts, nuts and washers in aluminum products. Next month we tackle a really tough subject — special fasteners.

Speaking of Electronics « « This industry is riding out the recession well, though indications of a soft spot are in slack sales of TV sets, radios and record players. John J. Dempsey, president of the Long Island Electronic Manufacturers Council, said that business so far in '61 has been relatively stable. Most of the Council's members, from the giants like Sperry Rand Corp. to the real small firms, are deep in defense work. Military spending for missile development and production is bound to go up, now, if the most recent Washington pronouncements mean anything. It will keep the electronics industry humming and should help suppliers of materials—aluminum, for instance.

Back at the Launching Pad « « Titanium might still score over stainless as the material for missile propellant containers. James D. Jackson, of Battelle Memorial Institute, told a national gathering of the American Institute of Chemical Engineers that "The need for high thrust in military and civilian missile systems has focused attention on high-energy fuels." The more powerful propellants, he said, are those handled as liquids at extremely low temperatures to permit smaller, thinner walled containers to be used. Titanium has more desirable strength-weight properties than stainless, he said, but titanium "occasionally has shown impact sensitivity to liquid oxygen fluorine," oxidizers used in liquid fuels. "If the impact problem can be solved," Jackson said, "titanium would have a great potential as a fuel tank material."

Adhesives: Tighter Than Ever « « The phrase, "piano wire and glue," was a term of derision for the fragile construction of the airplanes of another era. While piano wire has gone its way, adhesives have experienced a tremendous resurgence — not only in aircraft, but in many other industries as well. Sophisticated resin type adhesives have taken the place of boiled derivatives of skins, bones and animal hoofs; the range of jobs they will do is enormous, and the bonding strength they give a joint is all but miraculous. Example: Our cover story (see page 46). Latest report is that epoxy-nylon resins show great promise for metal-to-metal joining. They're still new, according to Frank J. Riel of Narmco Industries, San Diego, Calif., but tests indicate excellent physical properties and "exceptional ease of fabrication." Present systems are supposed to be useful over the —400 to +200°F range on titanium as well as aluminum and magnesium. Tensile shear strengths in excess of 5000 psi are claimed for titanium bonds. Bond strength on aluminum rises from 4000 psi at —400°F to more than 6000 psi at room temperature, and about 3000 psi at 200°F.

Remember Us? « « If you didn't instantly recognize your favorite magazine this month, blame that hopped-up signature cut on the front cover. We fussed a bit with the lettering, but the name's the same — and so's the aim. When an industrial magazine alters its front cover it usually assures the world that the job took two and a half years of intensive reader research and cost at least quarter of a million bucks. Well, we asked six readers and three relatives what they think of the new design. Can't remember what they said. The cost, including cigarets, booze and tips, came to about 42 bucks. Considering the enormity of the effort, we'll probably stick with this new signature at least three months. And one of these days we hope to add a motto explaining what the hell we're trying to do here. Something clear and concise like: "Modern Metals—the monthly magazine that publishes all sorts of wondrous things about the production, fabrication, casting, die casting, finishing, joining, designing and selling of products made of aluminum, magnesium, titanium, beryllium, zirconium and all points west." It still needs a little work. Any suggestions



Sunbeam Furnace holds close tolerances at American Screen Products

American Screen Products Company is the world's largest manufacturer of high quality roll formed aluminum screening. They recently installed this new SUNBEAM annealing furnace as an integral part of their reduction mill operations for processing aluminum coil.

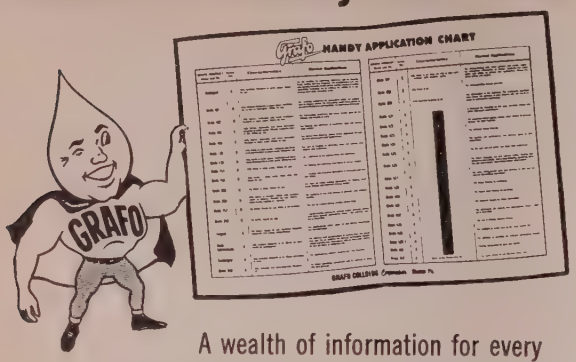
This furnace was specifically designed to heat 30,000 pounds of aluminum coil from 70°F. to 900°F. in six hours. Temperature tolerances of plus or minus 10°F. have been maintained in the 500°F. to 1200°F. range. In addition to meeting these basic furnace specifications, SUNBEAM engineers devised a unique continuous roller chain* for carrying the furnace car in and out of the furnace. No other furnace builder offered this important design feature, which reduces the cost of maintenance and eliminates lubrication.

This is another case where SUNBEAM project and design engineers drew upon their vast experience with aluminum to design and build a superior furnace. This creative engineering can be yours—your key to greater efficiency . . . increased production . . a finished product of highest quality. Write or call Sunbeam Equipment Corporation, 196 Mercer Street, Meadville, Pennsylvania.

*Patent Applied For

INDUSTRIAL Sunbeam FURNACES

Send for this handy chart now!



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New Enterprise

An aluminum **handrail system** that is versatile, eas installed, and economical is called Alurail by Alu num Railing Corp., 1127 Western Ave., Las Veg Nev. Railings are said to accommodate any stair ang require only a hacksaw, drill and small wrench f installation; come in natural aluminum finish.

A **cryogenic control valve** designed specially f helium operations, but adaptable for other gases, housed in an aluminum body. The solenoid plung and poppet are directly coupled in this three-way un Weatherhead Co., 300 E. 131 St., Cleveland 8, offe the valves with end fittings for flared or flareless tu ing in sizes ranging from ¼ to ½ inch.

A new extruder—Metalonics Corp.—has opened sh at 40 W. Third St., Boston 27. The firm has an 800-t press which initially is turning out clad metals in t form of **rod and special shapes.** Tubing is expected be produced later. The company is also equipped wi drawing, coiling, cutting and straightening facilitie Norman R. Gardner is president of Metalonics.

Japan's largest producer of **primary aluminum,** Ni pon Light Metals Co., Tokyo, has started an expansio program designed to more than double its annu production capacity, raising it to 150,000 tons.

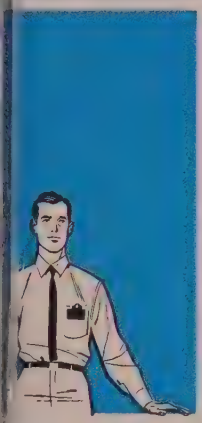
A **structural erection service** has been instituted Reynolds Metals Co.'s Phoenix, Ariz., structural fab cation plant. Charlie F. Weed heads the new operatio which is primarily responsible for on-site erection he to customers.

A shiny jacket is giving the potato a new look f the dinner plate. This **potato shell,** available fro Kaiser Aluminum and Chemical Sales Co., Oaklan Calif., is made of .0025 foil and holds 3 fluid ounc It is designed primarily for mass feeding operatio where keeping food warm is a problem.

A special group to concentrate on commercial a military uses for the **gas turbine engine** has been orga ized by Wyman-Gordon Co., Worcester, Mass. T firm manufactures turbine components for missil rockets, etc.

Aluminum **handles** for electronic drawers, inst ment panels, cabinets and doors are being cast Chassis-Trak Corp., 600 W. Florence Ave., Inglewo 1, Calif. The handles come with either a satin or bla anodized finish; with /or without push-button pa lock.

Preliminary plans are being drafted by Norwa state-owned aluminum company, A/S Ardal and Su dal Verk, for a **new smelter** with an annual capac of 100,000 tons. While decisions are being made, w continues on another expansion program to boost sm ing furnace capacity at Ardal. Production of smelti



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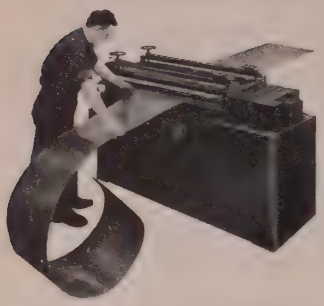

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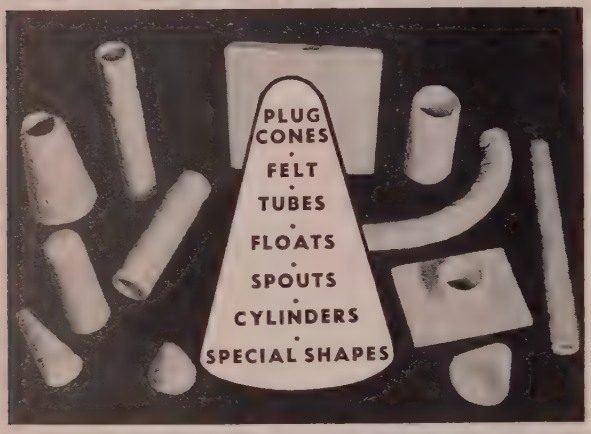

★ Sealing cones to fit Tap Hole Plugs in aluminum melting furnaces — resilient — labor saving — economical — give a positive seal — cleaner melting. WRP®-X products not wet by molten aluminum withstand in excess of 2200° F.

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furnaces is expected to begin in October, raising a nual capacity from 60,000 to 100,000 tons.

An all-aluminum **packaging machine** made by M Co., San Mateo, Calif., is said to provide movers with system of barrel packing that is fast, cheap and sa The unit wraps a tight plastic film over articles, a chroring them to a corrugated board.

A mushroom shaped aluminum housing covers f wheels of **roof ventilators** produced by Ilg Elect Ventilating Co., 2828 N. Pulaski Road, Chicago Fans come in 11 ventilating sizes, for exhausting fr 87 to 21,100 cfm.

Attractive protection from rain and sun is provid for shoppers at the new Consumers Cooperative Sho ping center in Berkeley, Calif., by an aluminu **louvered canopy.** It was fabricated of pre-colored sh by RNH Mfg. Co., Richmond, Calif.

An aluminum filter and aluminum housing are i portant components of the Model D-5 **dust collec** produced by Cincinnati Fan and Ventilator Cor 3546 Montgomery Rd., Cincinnati 7. The small u is powered by a ½-hp motor and is used near du chip and shaving producing machinery.

Complete fabrication and design services for all ty of aluminum and steel **structural components** are bei offered at the recently completed plant of Kaufm Enterprises Inc., Kaufman, Texas.

Alcoa's Rome Cable Div'n has established a n **electrical cable** production facility in East Los Angel Calif. The firm says this was done in an effort "to m the growing and complex needs of the missile, roc and electronic instrumentation fields."

The new clinic at Wenatchee, Wash., is a haven f the sick and a perfect example of how aluminum pr ucts can be combined to form a structure of hi esthetic appeal. Aluminum **curtain walls** surround t building and blend with white porcelain-enamel panels and small colored facade sections. Fentron dustries, Seattle, Wash. and Bradley Products I Missoula, Mont., supplied the aluminum componer

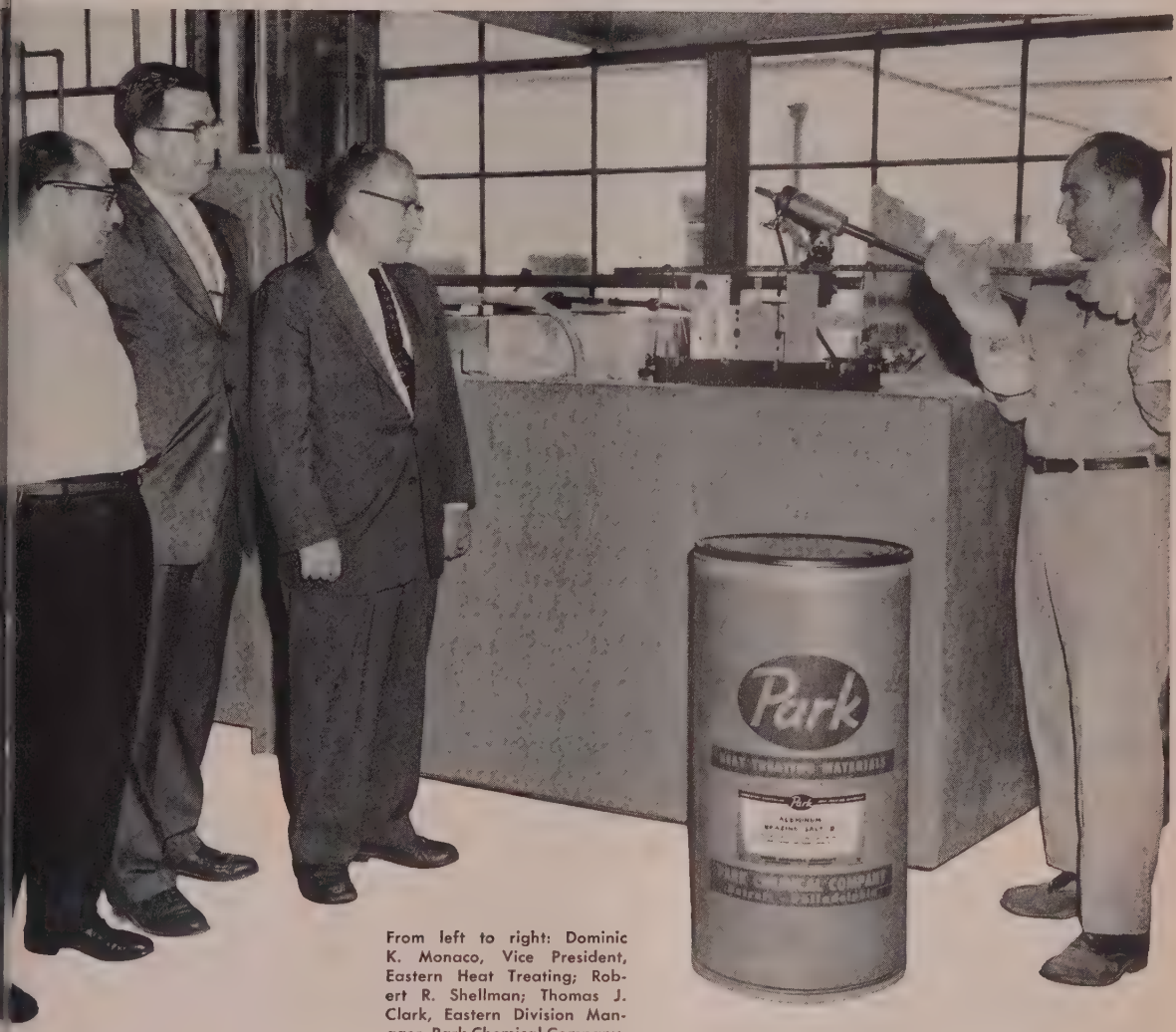
Six aluminum forgings form **engine mounts** in t sleek Aero Commander executive plane manufactur by Aero Design & Engineering Co., Bethany, Ok Firm says aluminum reduces plane weight and cuts p duction time 40% under that required to manufactu built-up mounts.

Truck bodies and custom built vans are being ma of aluminum at the new Troy, Ala., plant of L coach & Truck Co. of Alabama Inc., a subsidiary the Oneonta, N. Y. firm.

The chaise lounge, matching folding chair and co tail table which won the 1961 Engineering Apc Award of the National Association of Summer Fur ture Manufacturers is being produced by Finkel O door Products Inc., Garfield, N. J. The **furniture** colorful molded polyropylene slats and polished a minum frames.

We Dip Braze Aluminum Efficiently and Economically with Park Aluminum Brazing Salt D"

S: ROBERT R. SHELLMAN, PRESIDENT, EASTERN HEAT TREATING AND BRAZING CORPORATION, GLEN COVE, LONG ISLAND, N. Y.



From left to right: Dominic K. Monaco, Vice President, Eastern Heat Treating; Robert R. Shellman; Thomas J. Clark, Eastern Division Manager, Park Chemical Company.

"We dip braze aluminum assemblies for the aircraft and electronic industries in a 3' x 3' x 2' electric furnace. This kind of work requires a salt which brazes perfectly without expensive maintenance or complicated chemical control. We are pleased with the reliability and operating simplicity of Park Aluminum Brazing Salt D. It always produces well brazed joints and never crusts or sludges. Aluminum Brazing Salt D completely satisfies our requirements for a dependable, efficient and economical dip brazing flux."

There is little we can add to what Mr. Shellman has said about Aluminum Brazing Salt D.

For prices or prompt technical information, contact your local Park Representative or write directly to Detroit.

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Woodside Rapid Carburizers (Non-Burning-Charcoal-Coke-Specifications) ● Park-Kase Liquid Carburizers ● Quenching and Tempering Oils ● Cyanide Mixtures ● Neutral Salt Baths ● High Speed Steel Hardening Salts ● Iso-Thermal Quenching and Tempering Salts ● Protective Coatings (No-Carb-No-Kase-No-Scale-No-Tride) ● Carbon Products (Charcoal-Crushed Coke-Pitch Coke-Lead Pot Carbon) ● Kold Grip Polishing Wheel Cement ● Par-Kem Metal Cleaners ● Cutting and Grinding Compounds (Kem-Cut — Kem-Grind — Blue Ice) ● Aluminum Brazing Salts and Fluxes

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Useful Data

Screws and bolts for a wide range of fastening jo are priced and illustrated in Catalog No. C-5, a ne 60-page price list of Southern Screw Co., Statesvil N. C. Included are wood screws, slotted and Phill head, in steel, brass, silicon bronze, aluminum a stainless; drive screws; wood and type u; and slott stove bolts in steel and brass. Also catalogued are m chine screws, slotted and Phillips; machine scr nuts; tapping screws, types A, B, and F, in slott and Phillips head; and carriage bolts. The book a gives hole size recommendations, specifications, weigh and decimal equivalents. Also available from Southe Screw are actual size charts illustrating various ty of screws. James D. McDade will send this mater on request.

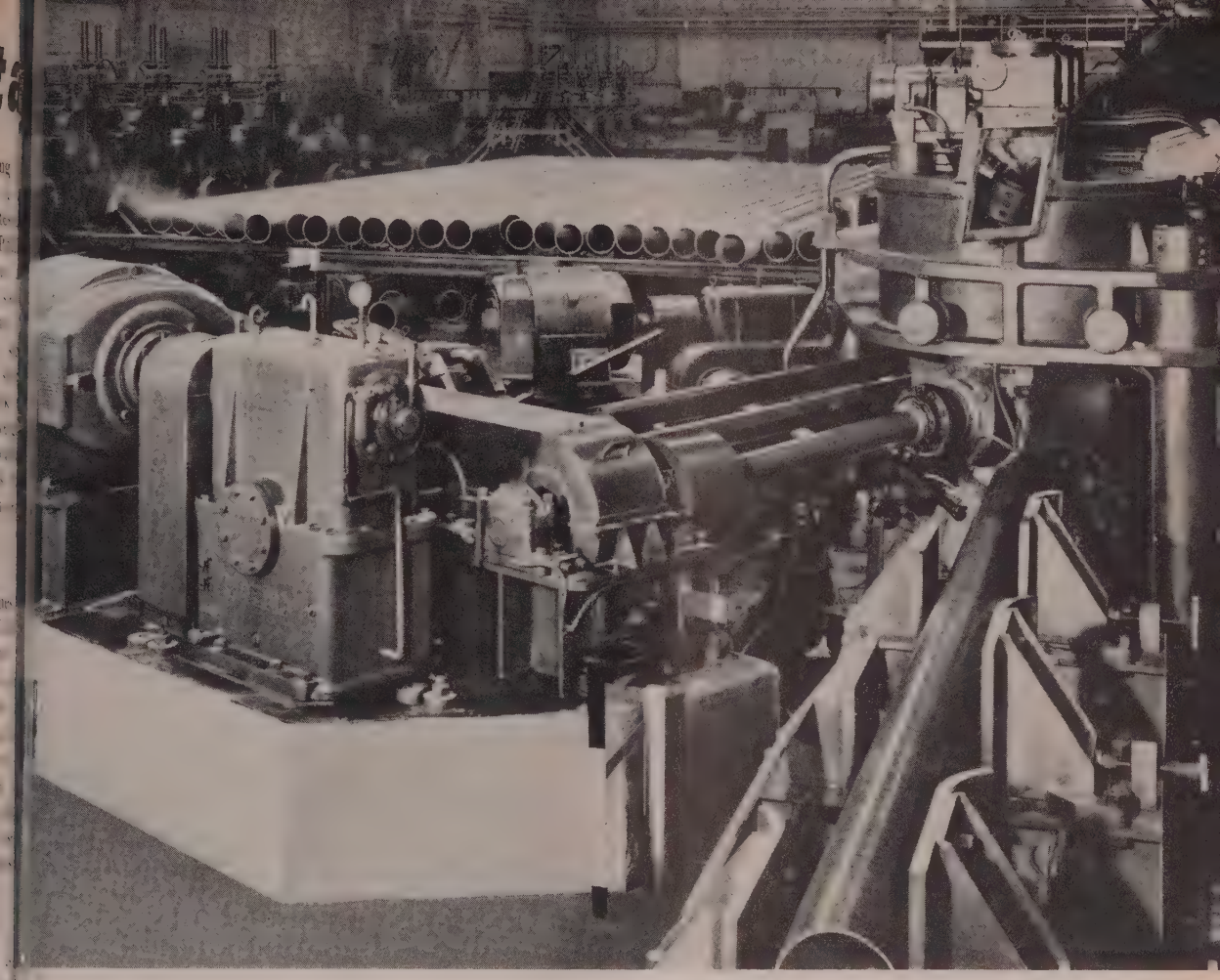
Design advantages of B&T die casting machines a discussed in a new folder put out by B&T Machi Co., Division of Greenlee Bros. & Co., 202-218 W. 8 St., Holland, Mich. B&T's unique toggle mechani is described in detail, showing how it provides f support to the four corners of the die and results platen stability. Also described are hot ends for t B&T zinc machine and cold chamber machine. C tional features of the machines are discussed in det In all cases, references are illustrated with close photos. Brochure D-802 will be mailed on request J. H. Petter, Sr.

The "inside story" of greater fastener strength is tailed in Bolt News, Vol. 26, No. 1, external organ The H. M. Harper Co., 8200 Lehigh Ave., Mor Grove, Ill. The booklet offers engineers a sound app ciation of what is involved in the manufacture of c sistently strong nuts and bolts; defines many of technical terms used in the evaluation of materials a illustrates them as they relate to fasteners. Also detai is how Harper produces nuts and bolts with ex duplicate strength factors. Write to Earle Channe Harper for this booklet.

Fastening tools such as power screw drivers, pi drills, and right angle drills are described in vari information pieces produced and distributed by A tool Mfg. Co., Springfield, Ohio. Write to the s manager for these brochures.

Maintaining efficiency of water wash paint sp booths is explained in a new folder recently publis by Oakite Products, Inc., 34E Rector St., New Yor The folder describes properties water treating c pounds should have for the maximum effect on p overspray. Pointing out that no single material work equally well with all paints, the folder lists s compounds which have proved successful in trea a wide range of organic and synthetic coatings.

(*Continued on pa*



How to straighten the really big pipe!

One major Eastern steel producer has found the answer — the big Mack-Hemp Model A-5 Straightener shown above—the largest of its type in the world!

This A-5 takes really big bowed pipe from the sizing mill, pulls it in through three pairs of opposed cross rolls and then spins it out straight and round to high tolerances in only a single pass.

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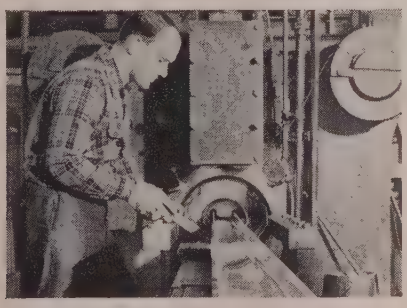

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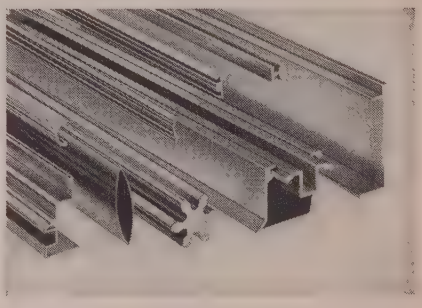

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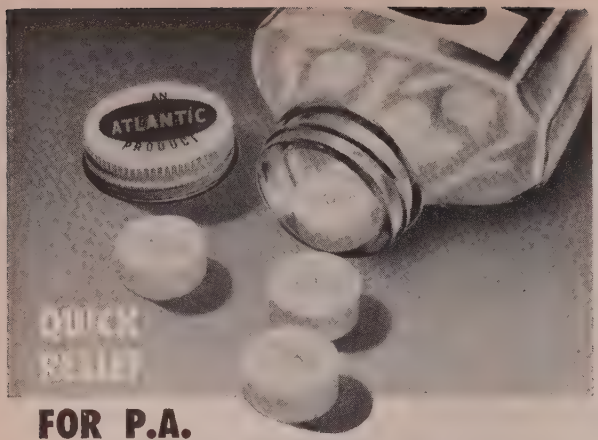

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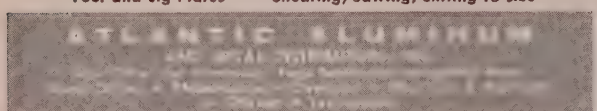

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The Verti-Slide machine might be of particular i terest to manufacturers who make or buy comple wire or strip parts. Unique shapes can be made by th machine at speeds of 90 to 250 pieces per minut replacing as many as five and six progressively tool presses. Normal secondary operations such as weldi are being done in one continuous automatic operati in excess of 100 pcs./min. Write to the advertisi manager, The Torrington Mfg. Co., 102 Frankl Drive, Torrington, Conn. for descriptive booklet.

Rivets and rivet setting equipment are detailed a 16-page illustrated bulletin prepared by Chicag Rivet & Machine Co., 950 So. 25th Ave., Bellwoo Ill. Featured are price lists of semi-tubular and dee hole rivets, shoulder and split rivets. Chicago Rive line of single, double and multiple rivet setters a pictured and described. A useful chart of standar clinch allowances is included in the bulletin whi can be had from William Shineflug.

Various designs of **steel and aluminum flooring a stair tread** made by Joseph T. Ryerson & Son, In are described and pictured in Technical Bulletin 50 The bulletin covers three types of open flooring, t kinds of stair tread, safety plate, aluminum tre plate and stair stringers. Pounds per square foot the different installations are charted, and tables safe loads are given. Other valuable information is cluded. Address your request to Ryerson's Mack Be nett at 16th and Rockwell Sts., Chicago 80.

"Questions and Answers about Porcelain Enamel Aluminum" is a new booklet put out by Reyno Metals Co., Richmond 18, Va. Twenty-four questi and their answers give a pretty complete picture the material's great workability and potential. Addr Dept. PRD-41 at Richmond for your copy.

Sheet Metal Machinery is catalogued in a 28-p booklet put out by The Lockformer Co., 4615 Roosevelt Road, Chicago 50, Ill. In it, lockformers a variety of sizes and types are pictured and describ Also shown are roll formers, power flangers, porta power machines, band saws and other Lockform accessories. All machines are pictured and accompan by full specifications. Write to W. M. Truska, Jr., this booklet.

Nialk trichlorethylene's effectiveness as a vapor greasing agent is detailed in a 38-page booklet put by Hooker Chemical Corp., 312 Union St., Niag Falls, N. Y. It includes general data such as phys and chemical properties of the compound and a list advantages of the metal degreasing grade. Also cove are principles of vapor degreasing; basic cleaning cyc types of degreasing equipment (these are diagramm

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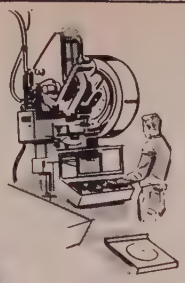

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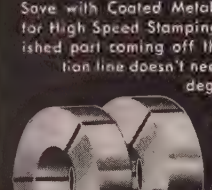

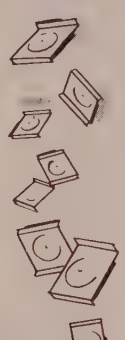

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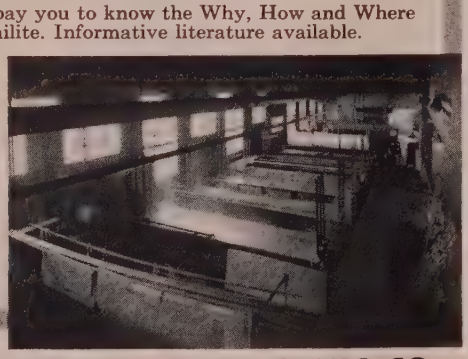

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graphically), and operating procedures. Other inform tion is given for the economical use of vapor degreasi

Cold Heading Bulletin S-100 is a new fastener inf mation piece produced by John Hassall, Inc., P.O. B 2256, Westbury, Long Island, N. Y. In the brochu the manufacturer seeks to show the advantages of co heading as compared to machining in the producti of fasteners of most types. Wide range of Hassall f teners are illustrated. Advertising manager will se this booklet on request.

"New Filter for Rolling Mills," an article publish in Modern Metals last year, has been reprinted. shows how a new De Laval filter system for rolling m oil contributes to improved product quality, spee production and cuts costs. Address the advertisi manager at De Laval Turbine Pacific Co., 201 Milbrae Ave., Milbrae, Calif.

Reprint of an article, "Welding of Foil," is n available from Air Reduction Sales Co., 150 E. 42 St., New York. The article had been a paper deliver before the American Welding Society Conventio Illustrated with graphs and photographs, the arti provides complete information on the control process variables in the successful welding of fo Problems and critical variables in the welding of f by the tungsten-inert-gas (TIG) process are inves gated under the three main sections in the artic Write to the advertising manager for form ADR 1

Fluxes for every soldering job are listed and scribed in a folder prepared by Lake Chemical C 3052 W. Carroll Ave., Chicago 12. It includes n acid, self-cleaning and non-corrosive types. Performan of the various products are described; details are giv as to packaging. Write to Miss E. Cooper.

The fine points of **vapor degreasing equipment** ma by Phillips Mfg. Co., 3475 Touhy Ave., Chicago are discussed in a collection of folders which defi the technique and illustrate the Phillips line. T advantages of constant vapor temperature operati (Phillsolv) and constant distillation and self-clean (reso-Kleen) are cited. A 16-page catalog inclu typical industry case histories. Bulletins 21 and give facts on vapor-spray-vapor and liquid-liquid-va degreasers respectively. Ask Milt Werner for this da

Air actuated devices for a variety of manufactur operations are detailed in the "Industrial Air Po Catalog" of Mead Specialties Co., Chicago. The 56-p booklet comprehends such work holding devices single and double acting "Air Clamp" work hold cylinders for milling, drilling and tapping operati and air valves, air presses, work feeders, impact h mers and collets. Typical installations are pictu and described. For a copy of the Mead catalog add the sales promotion manager at 4114 N. Knox A Chicago 41.

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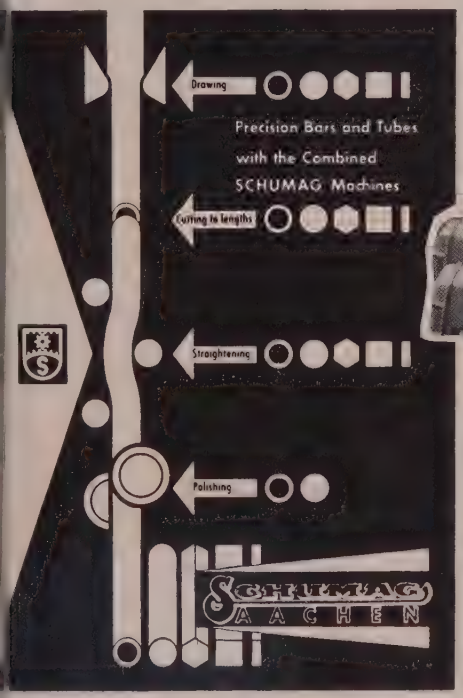

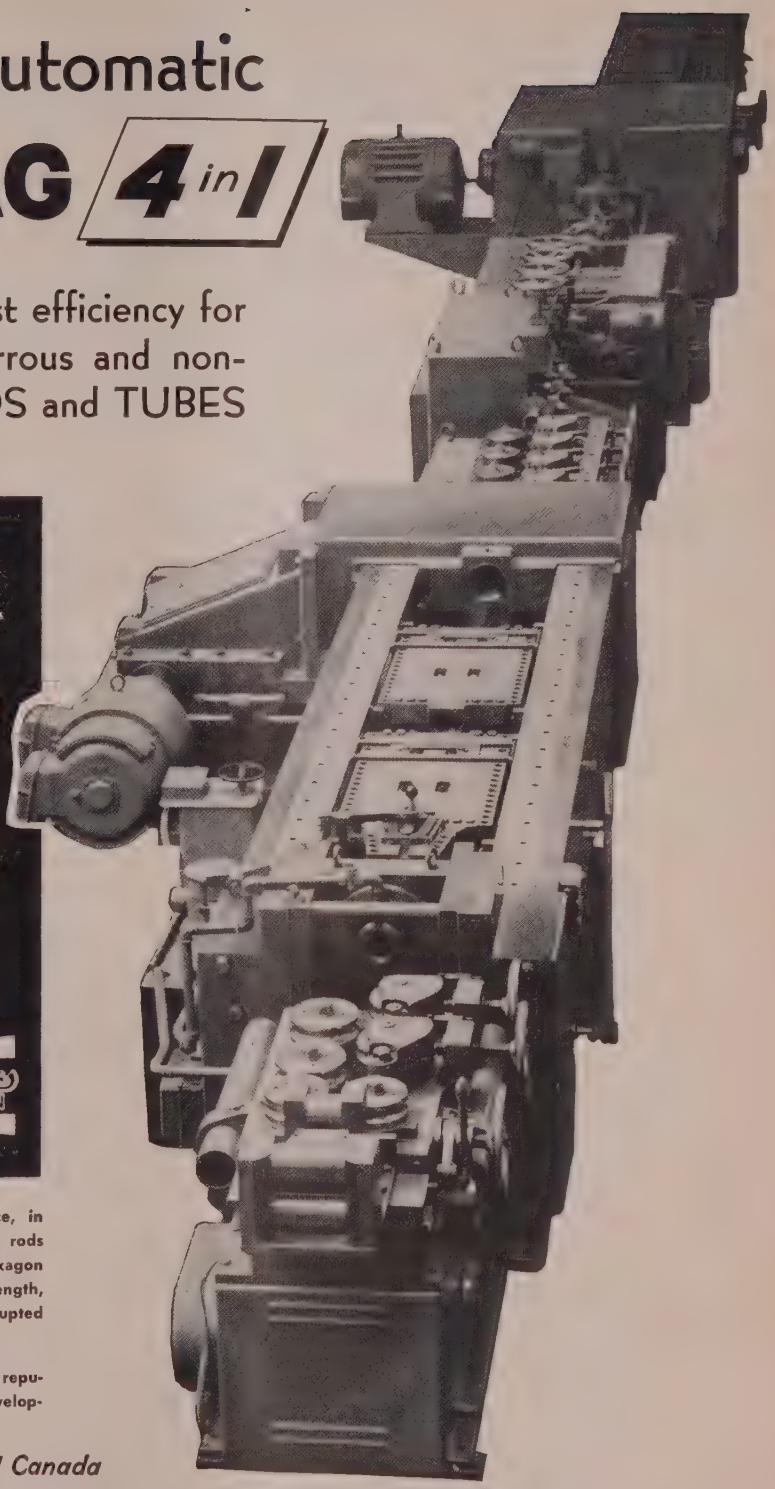

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Welding Aluminum

Part II: Mechanical Properties of Welds

This final segment of Modern Metals' series on Welding Aluminum details the affect the heat of welding has on the weldable aluminum alloys. Selection of alloys and methods of compensating for loss of strength through design are covered.

Based on information supplied by Aluminium Laboratories Limited, Research Division of Aluminium Limited

THE heat of welding causes a definite loss in the properties of aluminum alloys. On this fact perhaps the strongest argument against welding aluminum is based. But encouragingly, the argument is gradually weakening as equipment, processes, techniques, alloys, design and joint efficiency improve.

The mechanical properties of the weldable alloys are affected to varying degrees by welding (see Table 1). The strength of non-heat treatable alloys after welding is slightly higher than annealed material irrespective of the temper of the alloy prior to welding. This loss results from welding heat which anneals, or partially anneals, a narrow zone adjacent to the weld. The extent of this zone is dependent on the speed of welding and other factors such as amount of cold work.

When the T-4 and T-6 tempers of the heat treatable alloys are welded, the as-welded properties are not reduced to the annealed values but fall only slightly below those of the unwelded T-4 material. This loss in strength is again due to weld heat which, in this case, reduces the effect of heat treatment in metal adjacent to the weld by precipitating alloying elements from solid solution.

In the annealed temper of heat treatable or non-heat treatable alloys there is no difference between welded and unwelded properties.

Some reduction in the as-welded properties of aluminum alloys must be expected due to their inherent characteristics. But a number of methods or techniques may be used to minimize this reduction in strength.

The extent to which the mechanical strength of aluminum alloys is reduced by welding is governed by the rate at which the weld and surrounding areas are heated up to and cooled down from weld temperature. Therefore, the faster this heating and cooling occurs, the less is the reduction in properties. For this reason the high speed MIG process is preferred for welding aluminum.

Another method of increasing aluminum weld joint efficiency is to use alloys whose properties are not reduced greatly by welding heat. As pointed out, it is generally accepted for design purposes that with the non-heat treatable alloys the as-welded properties are those of the annealed material. Therefore, if you weld a non-heat treatable alloy which has high properties in the annealed condition these high properties will not be reduced by welding.

This is so with aluminum-magnesiu alloys (e.g. 5154). The annealed prop ties of these alloys prior to weldi are, with the exception of the yie strength, comparable with those of 60 T-6. After welding, however, these loys exhibit properties somewhat excess of those of as-welded 6061-T And the increased elongation of the welded Al-Mg group over 6061-T6 significant making these alloys a na ral choice where forming or bendi is necessary during fabrication.

Sometimes, an improved weld desi will increase joint efficiency. In the p many assemblies designed for riveti were welded. This is unsatisfacte since stress concentrations which wo not appreciably influence the efficie of a riveted joint may be built up the weld area and cause failure.

But if a structure is designed welding, the joints can usually be cated away from highly stressed ar so the welded structure will be as ficient, if not more so, as a sim riveted assembly. If welds must be m in highly stressed areas, the joint sometimes be reinforced so efficie at least equals that of a riveted joi

The impact resistance of welded minum structures compares favora with that of riveted structures in same alloys providing the welded ass ly is properly designed and the v beads are left on. Also, welds in softer aluminum alloys withstand sh loading better than those in the ha alloys, due to the higher ductility more uniform strength of soft met

In fillet welds the parent alloy, cause of dilution, exerts some influ on the longitudinal and transverse s strength of a fillet or lap joint, but

(Continued on pages 34 an

TABLE 2: Typical Shear Properties Of Some MIG Welded Aluminum Alloys

Parent Metal	Filler Metal	Typical Longitudinal Shear (PSI)	Typical Transverse Shear (PSI)
1100	1100,3003	14,000	14,000
3003	1100,3003	14,000	14,000
5052	5056	22,000	24,000
6061	4043	20,000	25,000

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TABLE 1: Typical Mechanical Properties of Unwelded and MIG Welded Aluminum Alloys

Alloy and Temper of Parent Metal		Filler Alloy		Unwelded Parent Metal			Butt Welded Joints			
A.A.	Alcan	A.A.	Alcan	Tensile Strength psi	Yield Strength psi	Elongation % in 2 inches	Shear Strength psi	Tensile Strength psi	Yield Strength psi(1)	Elongation % in 2 in.(1)
NON-HEAT TREATABLE ALLOYS										
1060-O	1S-O	4043 or 1060	33S or 2S	11,500	4,500	37	9,000	11,500	4,500	25
1060-H14	1S-H14	4043 or 1060	33S or 2S	16,500	15,500	8	10,500	11,500	6,000	20
1060-H18	1S-H18	4043 or 1060	33S or 2S	22,000	21,000	7	12,000	11,500	6,000	15
1100-0	2S-0	4043 or 1100	33S or 2S	13,500	5,500	35	9,500	13,500	5,500	25
1100-H14	2S-H14	4043 or 1100	33S or 2S	17,000	16,000	9	11,000	13,500	6,500	20
1100-H18	2S-H18	4043 or 1100	33S or 2S	26,500	24,000	6	13,000	13,500	6,500	15
3003-O	3S-0	4043 or 1100	33S or 2S	16,000	7,000	32	11,000	16,000	7,000	25
3003-H14	3S-H14	4043 or 1100	33S or 2S	21,500	20,000	8	14,000	16,000	8,500	20
3003-H18	3S-H18	4043 or 1100	33S or 2S	29,000	27,000	4	16,000	16,000	8,500	15
	B54S-H21 or H-11	5356	56S	43,000	25,000	23	24,000	40,000	20,000	16
5154-H11A	C54S-H11A	5254	C54S	38,000	30,000	17		35,000	18,000	14
5052-O	57S-O	5356	56S	29,000	14,000	23	18,000	29,000	14,000	22
5052-F	57S-F	5356	56S					32,000	18,000	18
HEAT TREATABLE ALLOYS AS WELDED										
6063-T5(2)	50S-T5(2)	4043 or 5356	33S or 56S	30,000	26,000	16	—	21,000	14,000	17
6063-T4(2)	50S-T4(2)	4043 or 5356	33S or 56S	23,000	14,000	30	15,000	21,000	14,000	17
6063-T6(2)	50S-T6(2)	4043 or 5356	33S or 56S	33,000	29,000	18	20,000	21,000	14,000	17
6061-T4	65S-T4	4043 or 5356	33S or 56S	35,000	21,000	22	24,000	29,000	20,000	8
6061-T6	65S-T6	4043 or 5356	33S or 56S	45,000	40,000	12	30,000	28,000	18,000	5
HEAT TREATABLE ALLOYS HEAT TREATED AND AGED AFTER WELDING										
6061 All Tempers	65S All Tempers	4043 or 5356	33S or 56S					42,000	37,000	8

NOTES: (1) These values are influenced by thickness of specimen.
(2) Extruded shapes.

(Continued on page

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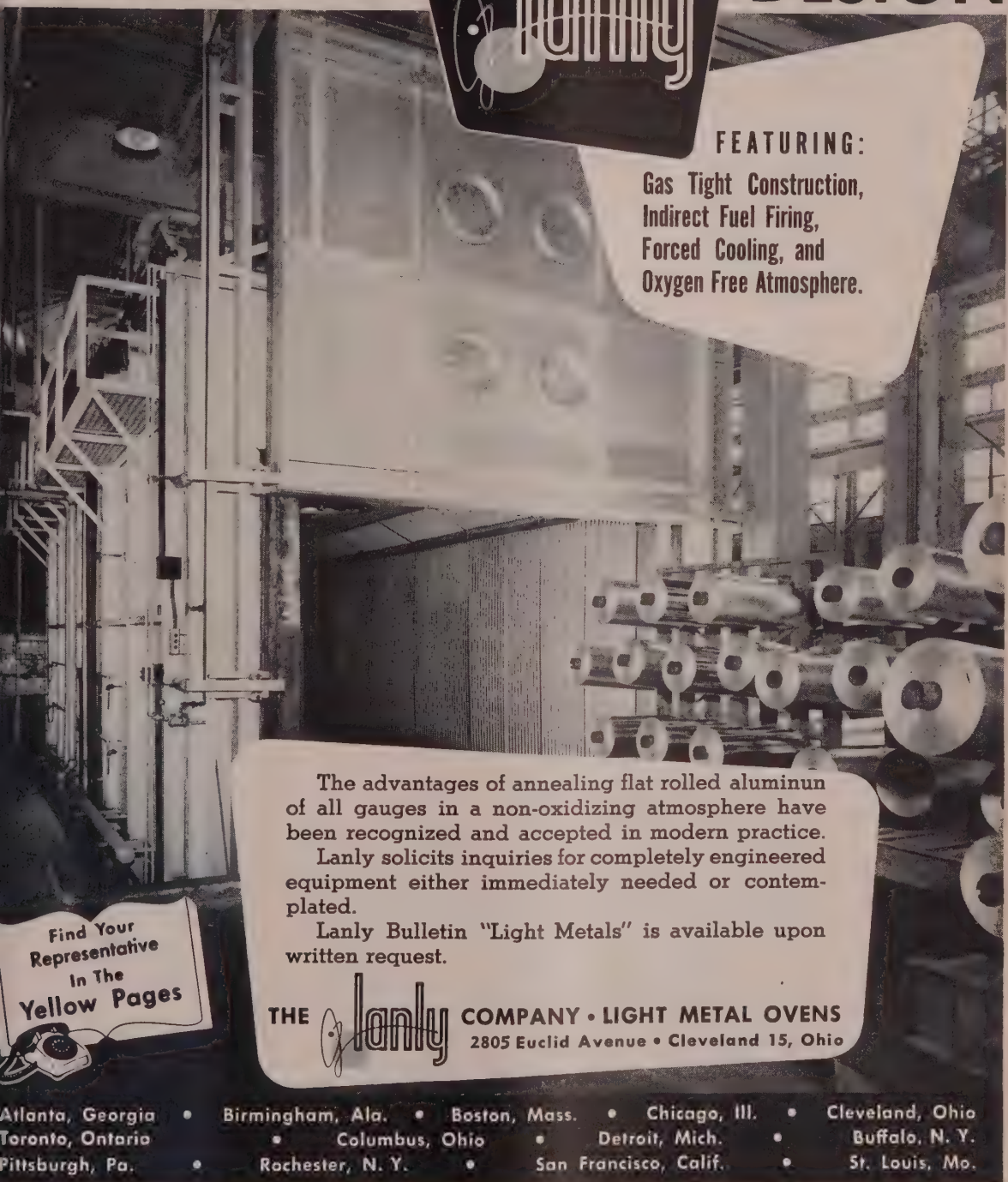

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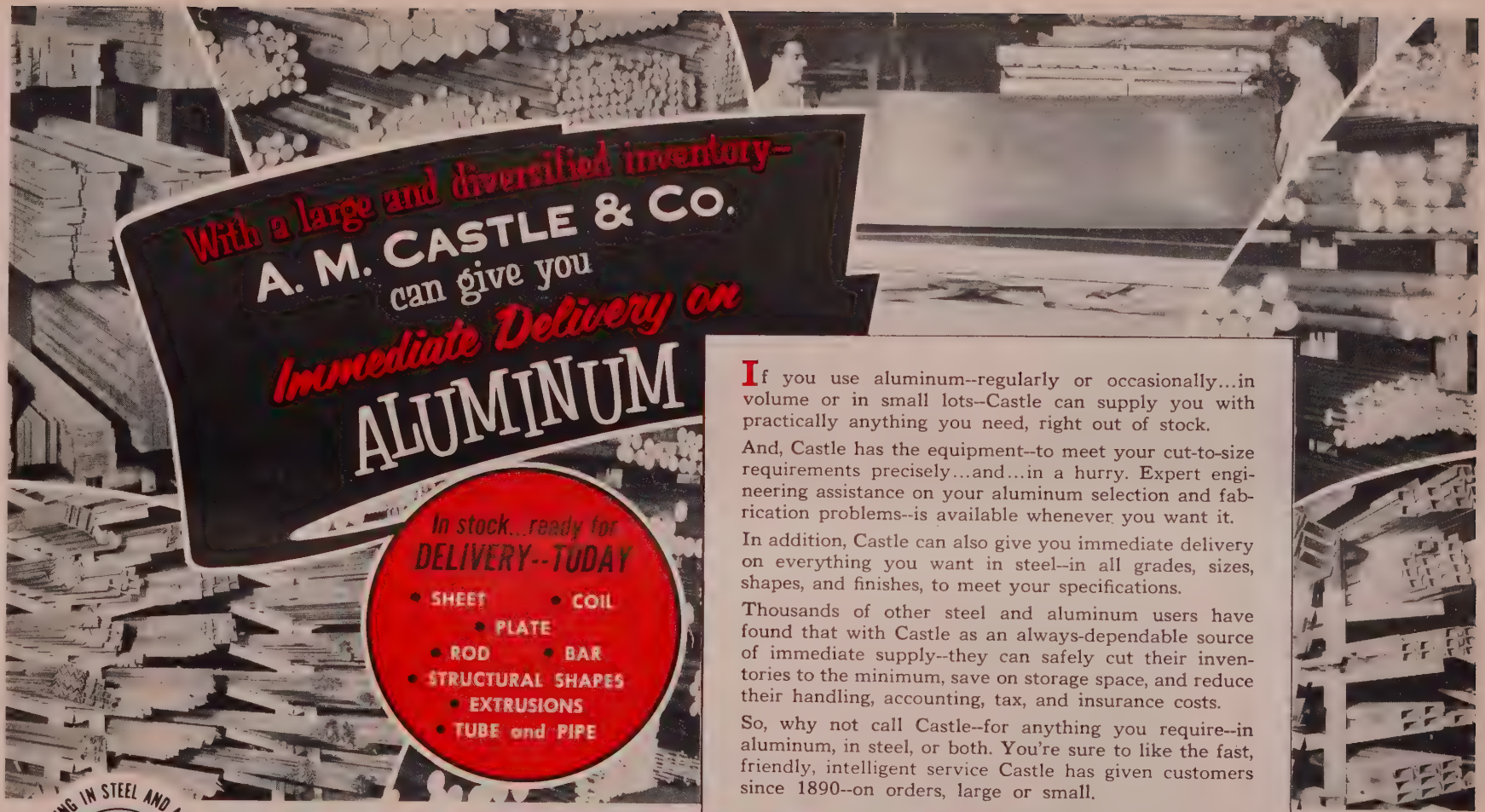

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ence of the filler is much greater. this reason the shear strength of a is given in terms of filler alloy rather than in the alloy of the base rial (see Table 2).

he fatigue strength of welds in alu- im alloys also compares favorably those of riveted joints.

r a very large number of cycles the ue properties of welds made in and 6061-T6 are practically equal. the other hand, fatigue strengths of welded joints for a small number cycles are about equal to their as- led ultimate tensile strength.

he design of the welded structure ts a very important influence on resistance of a weldment to fatigue ses. The following points are im- tant in designing a welded structure dequate fatigue strength:

Welded joints should be symmetrical utt joint has better fatigue proper- than a lap joint).

Notches which produce stress risers t be avoided. Such defects as un- utting, cracking, lack of penetra- , excessive porosity and spatter ld not be present in any welds.

Weld reinforcing and penetration ld be ground or dressed flush with plate or section being welded.

Manholes, brackets and fittings should be located near welds or in highly ssed areas.

The ductility of steel, particularly ded steel, decreases as the tempera- decreases. But zero and sub-zero peratures do not reduce the strength ductility of welded or unwelded alu- um alloys. Special costly operations be performed during the steel- king process to overcome steel's low perature brittleness, but this appre- ly reduces the price difference be- en aluminum and steel.

At elevated temperatures, however, properties of aluminum alloys drop rapidly with increases in temperature er 212° F, while steel maintains its ength at much higher temperatures. These facts produce a simple rule: zero and sub-zero temperatures weld- aluminum structures will perform tter than steel ones; but at elevated nperatures, welds in steel exhibit su- rior properties.

The strength of welds in the heat atable aluminum alloys can be re- red almost to the original values by heat treatment after welding. How- er, this practice is limited by the e of the weldment and by the quench- g required in solution heat treatment. Also, quenching from the heat treat- nt temperature usually results in dis- tion of the welded assembly unless its ape is such that it naturally opposes e stresses and consequent distortion ually imposed by quenching.

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The Realities of Today's EXTRUSION ECONOMICS

Efficiency is the key to survival in the fiercely competitive extrusion market, according to equipment manufacturer. Labor cost must be trimmed by modernizing the production capacity.

By J. A. Logan, President, Ajax Magnethermic Corp., Youngstown, Ohio

THOSE were the good old days—Why I remember when . . ."

This was part of a conversation overheard the other day between two old timers in the extrusion field. They're not necessarily old—could be in their early thirties. But they're old timers in the extrusion business, having been in it during the early fifties.

Those were *their* good old days — when a man could spend $150,000.00 for a press, billet heater, and other auxiliaries, rent a 10,000 square foot building, let the world know he was in the extrusion business, and then reap enough profits in a year to pay off the whole plant.

It wasn't as easy as that, of course. There were labor troubles, government controls, Korea, and many other problems. But the price was strong, profits were high, and not one extruder in five knew what you meant when you referred to "return on investment." You returned 100% in the first year, or it wasn't a good deal.

But those days are gone. Total extrusion sales have increased substantially in the last ten years—but so has extrusion capacity. Aluminum extrusion is a simple metalworking process. Many entered the business before they knew whether the extrusion came out of the press or the billet heater. Now we have lots of capacity — not all good, but at least able to make an extrusion of sorts.

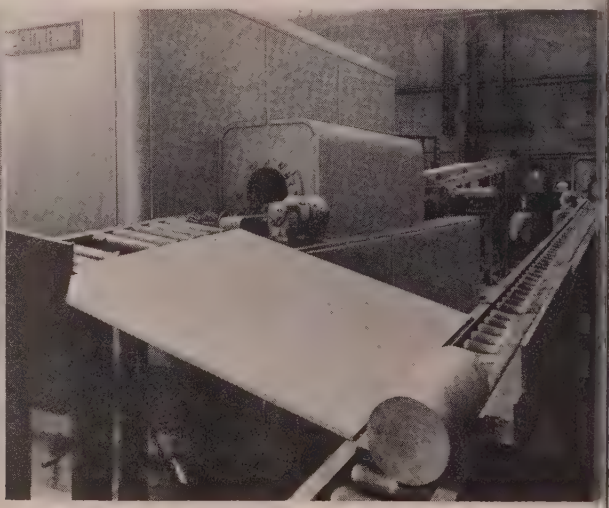
Some Extruders Will Go

This present market will separate the men from the boys. Some won't be around in a few years; others will prosper and grow with the times.

A well planned and managed operation will make out in today's market. It takes a reasonable knowledge of the market and the extrusion process to make the proper decisions concerni the many problems involved in starti and running a paying operation tod It takes a knowledge of costs to avo pricing yourself into bankruptcy.

There are over 300 of our extrusi billet heater installations in operatio Members of our sales and service gro probably visit over 100 extrusion pla a year. We think we know a little abo the economics of the process. Our he ers cost more initially, and their fu generally costs more than other metho of billet heating. Yet over 80% of t postwar extrusion installations utili our equipment. The reason: The o erating economics of our equipme used with a modern high speed extr sion press favor induction heating.

Aluminum extrusion is no differe from other processes. You look at ca tal investment, direct costs, potent production and other items and try



■ *The old and the new are shown above. At left is one of the early post war extrusion installations. It is capable of extruding 350 net pounds per hour. Total labor force needed on this press, including the stretcher, is 8 men. At right, in foreground, is an Ajax Magnethermic billet heater and oth components of a modern high capacity extrusion installati This installation can extrude 9000 pounds per hour, but i quires only 6 men for operation.*

Kinkead Industries' Finishing Engineer, E. P. Bangs, and Plating Department Foreman, W. Janski, compare notes on finishing operations with Diversey D-man, R. W. Dinsmore.

IVERSEY #596 ALUMINUM DESMUTTER

completely removes smut in three minutes or less . . .

very dollar you can cut from plating costs puts your firm in a better mpetitive position. Diversey #596 desmuts such problem alloys as)24 and 6061 in three minutes or less—works even faster on other loys. Excellent results are obtained at low concentrations, requiring ss compound. Field experience has proven that 4 to 6 ounces of 596 per gallon with 5% (by volume) sulfuric acid produce excellent sults on most aluminum alloys including 2024 and 6061. Higher ncentrations are needed only for extremely troublesome alloys hen production speed must be maintained.

Call your Diversey D-Man and have him show you how Diversey 596 can cut production costs in your plant. For literature write HE DIVERSEY CORPORATION, Chicago, Illinois.

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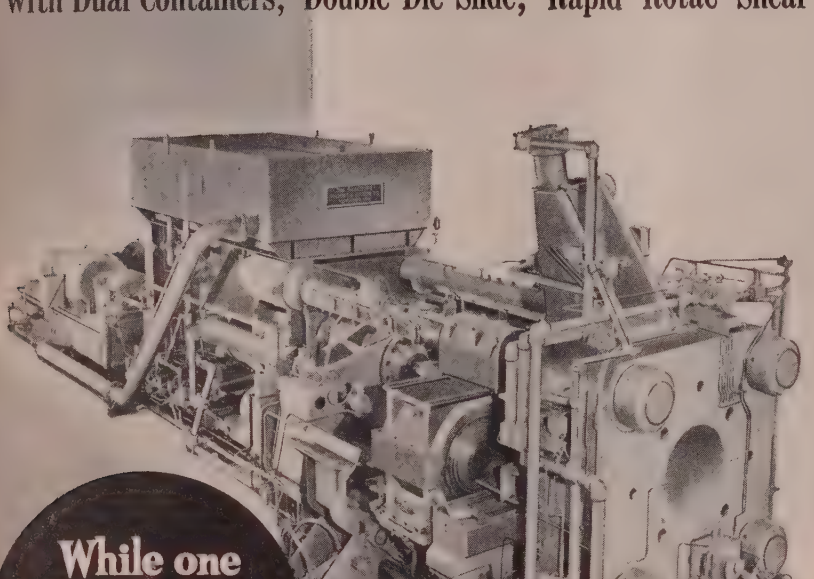
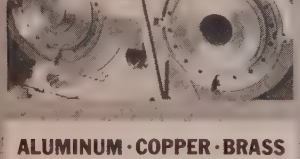


While one billet is extruded another is loaded *automatically*

with DUAL CONTAINERS



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Flexibility of Die Slide Design permits easy adaptability for extrusion of copper and brass. Auxiliary components enable operator to eject "skulls" from container and to load billets while billets are being extruded.

Double tooling permits cooling without detracting from cycle time.

Properly cooled dies permit higher extrusion speeds. It reduces pickup and produces the ultimate in surface quality.

"Rotac" shears in approximately 2 seconds —¼ the time of conventional butt shear.

Whether your need is for a complete extrusion plant, a new press, auxiliary equipment, or revamping of present equipment, it will pay you to consult a "Y F & M" extrusion engineer.

**Patent Applied For.*

The Youngstown Foundry & Machine Co.

Youngstown 1, Ohio

strike a balance that will leave y some profit at the end of the year

Take a 1550-ton extrusion press stallation. Initial investment for equ ment will run $200,000.00. Operati two shifts a day and depreciating equipment over a 10-year period ma the depreciation charge $5.00 per ho Figure a 10-man crew at $30.00 p hour, tooling at $20.00 per hour (this low), and electricity at $5.00 per ho (including billet heating, press mo and miscellaneous equipment), and a $20.00 per hour for interest on inv tory, rent, heat and supervision. The are also fixed costs such as insuran and maintenance, but let's stop here a recapitulate.

Total Cost — $80 An Hour

This all adds up to about $80.00 p hour for the operation, based on t shifts per week. Note that labor is t most significant cost item—equal to times the cost of depreciation.

With the equipment available in t early fifties this installation might pr duce 10,000 pounds per shift at a fa tory cost of 6.4 cents per pound. Yo can work on this operation from no 'til next Christmas and it will be ha to make any great reduction in the costs. Cut the cost of electricity half and you save $875.00 a month a meager 1/5 of a cent per pound.

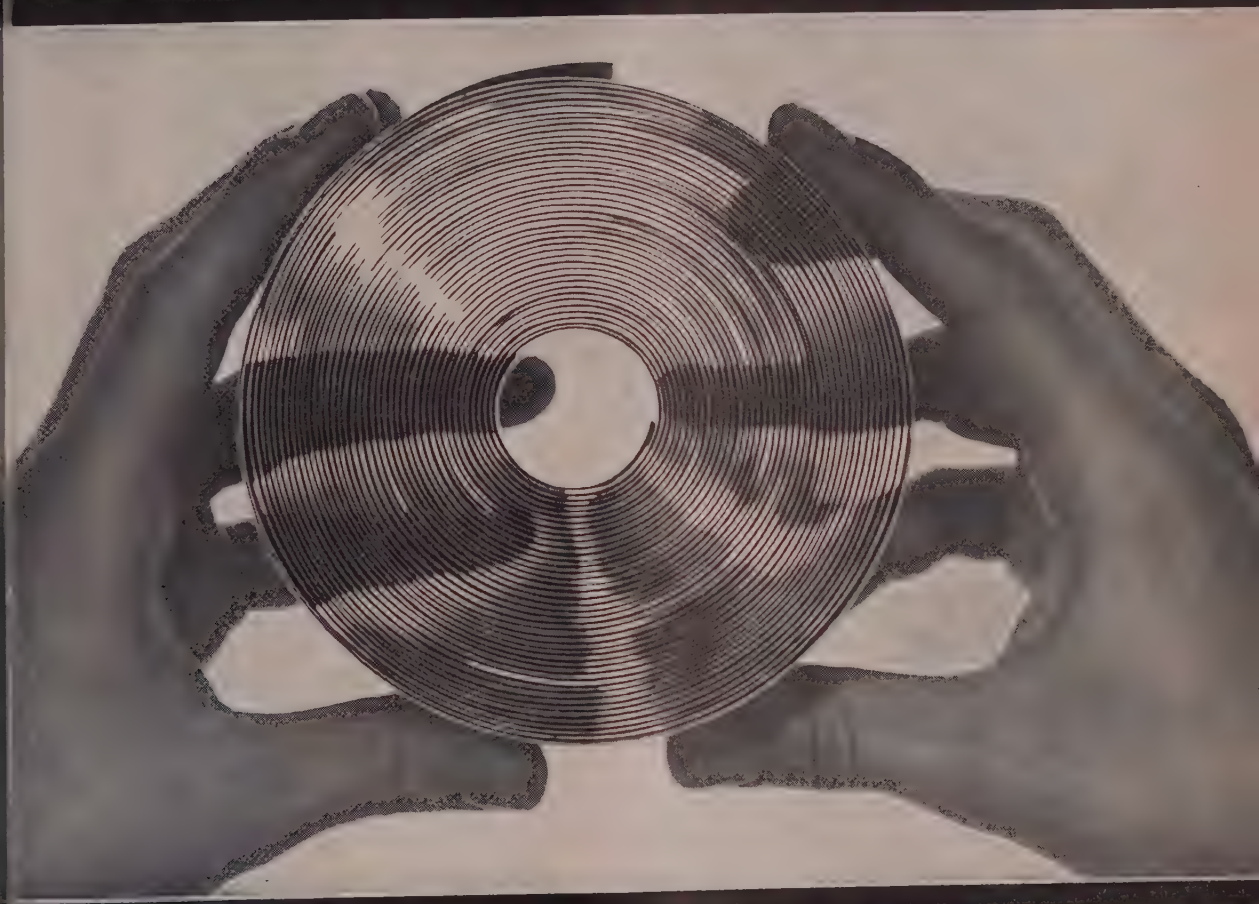
On the other hand, assume that t most efficient operation with moder automated equipment costs $30,000 mo than this minimum operation and w boost production 10%. This would i crease depreciation 75c per hour a with a gross profit of 8c a pound t increased return on investment wou be $10 per hour of operation or $35 per month. This is the type of log used by metalworking companies, lar and small, in weighing the economi of equipment. Too few extruders attack the problem from this angle. long as metal comes through the di they figure they're in business.

Who Can Compete?

How can the man with an obsole plant compete with these results? H can't. Plants are trying to exist tod in which 9 presses (some of them hom made) are almost out-producing 3 mo ern 1500 ton extrusion presses with i duction billet heaters. The former ty of plant is running backward and wi help increase bankruptcy statistics the very near future. His depreciatio is low, but his major item—labor—is times that of his competitor. He spending $270.00 per hour for labo where the other fellow spends $90.0

Even with his depreciation at zero h saves only $45.00 per hour. Thus, h net additional cost, considering the two items alone, is $135.00 per hou

Why is this metal coil half air?



To provide an air space between each lamination of the coil! This is the key to a revolutionary new method of metal annealing, known as the Open Coil Process. By "opening" the coil and exposing the entire surface to active gases, metal reaches the soak period in a much shorter period of time. The entire coil gets to temperature evenly, resulting in a more uniform anneal throughout. Cool-down time is correspondingly reduced. Thus, the Open Coil Process of Annealing produces a better product, faster, at lower cost. For complete data contact your Lee Wilson sales engineer or write direct.

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MAKE THE BEST METALS BETTER

*OPEN COIL AND SINGLE STACK FURNACES

For growth-minded small firms:

A New Type of Long-Term Loan

by LeRoy L. Kohn, President

Mercantile Discount Corporation, Chicago

WITHIN the last three years a new development in financing has quietly taken place in industry—a sort of lend-lease plan for companies in the small to medium-sized category.

It involves only about $80 million in loans to date, but since $3.6 million of these loans went into the aluminum fabricating industry, a brief discussion of this new form of financing should be of interest to others in the aluminum field.

ONE ALUMINUM FABRICATOR USED HIS LONG-TERM LOAN THIS WAY

	Before Loan	After Loan
ASSETS		
Cash	$ 0	$ 50,000
Accounts receivable	300,000	300,000
Inventory	225,000	225,000
Total Current Assets	$525,000	$575,000
Fixed assets (net)	280,000	280,000
Other assets	6,000	6,000
Total Assets	$811,000	$861,000
LIABILITIES		
Bank notes payable	$190,000	0
Accounts payable	260,000	110,000
Accrued taxes	29,000	29,000
Accrued payroll	10,000	10,000
Accrued insurance	3,000	3,000
Secured loan current	0	80,000
Total Current Liabilities	$492,000	$232,000
Long term debt:		
Capital loan	0	310,000
Total Liabilities	$492,000	$542,000
CAPITAL		
Total capital	400,000	400,000
Total Liabilities and Capital	$892,000	$942,000
WORKING CAPITAL		
Current assets	$525,000	$575,000
Current liabilities	492,000	232,000
Working Capital	$ 33,000	$343,000
CURRENT RATIO:	1.04-to-1	2.48-to-1

Mercantile Discount Corp. and mai leading lending institutions have bee experimenting with capital loans fo manufacturers. Simply summarized, t group makes long-term (up to five yea capital loans to companies, the loa to be channeled through Mercantile Di count, which then administers the l nancing operation for the entire grou

Different Because . . .

These loans are unique in that n share of ownership or profit is involve They are a sort of private banking len lease to private industry. (The minimu loan is $75,000; the maximum $2,000,000.)

Who is eligible for such capital loa and what are the requirements?

Any aluminum fabricating compa with a history of growth is eligible fo the loans. However, four specific cond tions are involved. The company mus

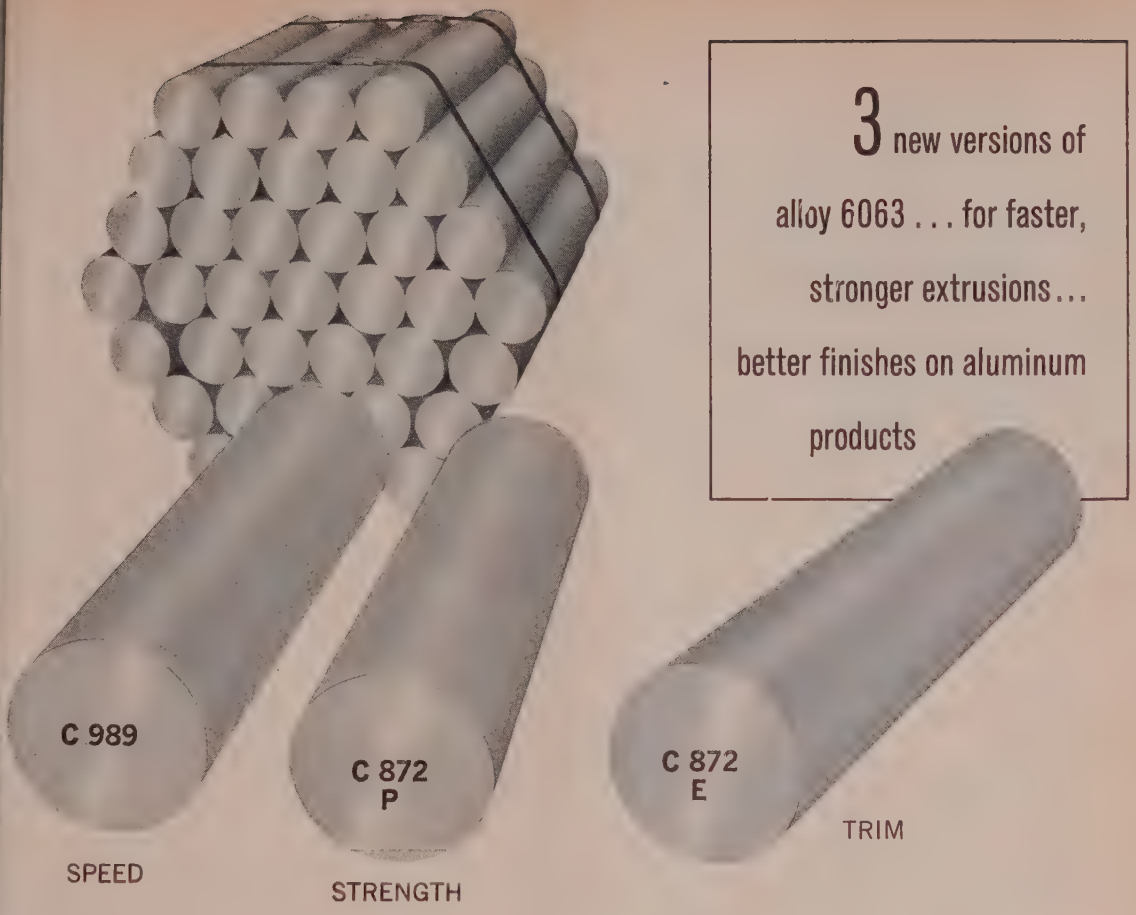
- Show that it has a competen management team and is not d pendent upon one man;
- Have a history of profits and sho evidence of realistic expansio possibilities;
- Show how the new cash will b used to help expand sales and i crease profits; and
- Demonstrate an ability to repay t loan over a 5-year period.

Bank Loans OK, but . . .

How do these loans differ from ban loans?

Bank loans are wonderful—if you c get them. But the tight money con tions of the last few years held ba all companies except the giants. T smaller and medium-sized compan with net worth from $100,000 to $1,00 000 have been hobbled in their grow because their major source of funds bank loans, and bank loans have be pretty tight these last few years.

Specifically, when banks make loa to commercial borrowers, they lo pretty hard at the borrower's net wor



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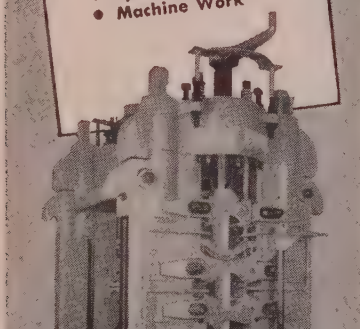
- Machine Work



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and restrict their loans to some percentage of the net worth. For example, to borrow $1, a manufacturer must have $4 in net worth. This is the general banking rule.

And, if the bank loan is unsecured, there is the matter of a compensating balance; i.e., the borrower must leave on deposit from 15% to 20% of the loan. This, too, tends to cut down the cash available to the borrower.

It's Potential That Counts

In the case of the long-term capital loans administered by Mercantile Discount, growth companies are judged more on the basis of current sales and earnings potential than on their present assets and net worth — although these latter are of importance as collateral.

However, it is the growth responsibility which distinguishes a progressive, booming company from a stodgy, mature company which is interested only in sitting still. Also, there are no compensating balances involved; the entire amount is available to the borrower.

Is there any restriction on how the capital loan funds may be used by the borrower?

Insurance company loans carry restrictions on dividends, salaries, balance sheet ratios, etc. Bank loans also carry the same general type of restrictions. But this new capital loan program does not have any such restrictions.

How one aluminum fabricator used its $390,000 long-term loan may be gauged from the balance sheet on page 42. Note that the company improved its cash position by $50,000 and working capital by $310,000, while its current ratio grew to 2.48-to-1 from 1.04-to-1.

This company was able to clean up short-term bank indebtedness, liquidate more than half the past-due payables, and substantially improve its credit rating — without taking in partners or selling stock.

Since the company's major difficulty was the fact that it didn't have enough working capital to keep up with its growing sales, a large share of the long-term loan was funneled into working capital uses.

Actually, the funds might be, and have been, used for other purposes: To accumulate inventories in advance of seasonal demand; to purchase new or specialized machinery and equipment; to buy out minority stockholders or partners; to effect a merger, etc. So long as the funds are used for a constructive business purpose, they are favorably regarded.

What about cost of these long-term capital loans?

This is one of the disadvantages of this program; the *interest rate* normally works out to be higher than bank rates. But if long-term bank cash is not ava able at any rate, or if bank loans a too small to carry the burden, what goo does a lower rate do?

In the case of the aluminum fabrica ing company whose balance sheet shown here, the increase in workir capital was $310,000. Normally, in th aluminum fabricating industry, *earnin on working capital* average aroun 25% after taxes — or 50% before taxe In the case of the aluminum fabricat whose balance sheet is shown here wi the long-term loan, the company earne 26% on net working capital after taxes but could earn as much as 30% on wor ing capital if the extra cash were ava able.

The cash would be used to expar production and keep up with sales, take trade discounts on all purchase and to pick up raw material bargai with ready money. In short, the ext $310,000 in working capital could (an did) generate about $71,000 in ext profit.

As a result, while the cost of th $390,000 capital loan was higher tha for bank cash — if a bank would mak such a loan — the larger earnings mad available through the capital loan mo than made up for any difference in rat

What are the steps in applying fo such capital funds?

In general the application is simpl A letter addressed to Mercantile Di count Corp. should present the follo ing items:

- A general estimate of the funds r quired and for what purpose the would be used — e.g., for workin capital, for inventory expansio for purchase of new equipmen etc. The minimum capital loan $75,000; the maximum is $2 000,000.
- A short history of the company.
- An audited balance sheet, and pro it-and-loss statement.

When a manufacturer signs up fo such a loan, is there any way of term inating this financing prior to th agreed period?

The loans may be terminated whe ever other methods of financing ar available and advantageous. The pr gram is designed only for prosperou companies whose working capital canno keep up with the demands of expandin production and sales.

It has happened that after two o three years of this program, a manu facturer has turned to public financin or bank financing and cancelled out th Mercantile Discount financing. This to be expected.

The program is precisely designed t act as a bridge from private financin to public financing, whenever the op portunity presents itself to the borrowe

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Extrusions + Adhesives = Versatile Light Poles

Requirements of cost, appearance, versatility and durability in new light standards for New York City are met by a unique design employing two C-shaped aluminum extrusions, adhesive-bonded together with epoxy. Two prototypes now being tested.

by J. P. Bush and J. A. Scott, Olin Mathieson Chemical Corp.

A VERSATILE new street lighting column made of two C-shaped aluminum extrusions, bonded together with an epoxy resin, is currently being evaluated by the City of New York.

The modified light standard also supports street signs and police and fire call boxes, and permits the arms supporting the luminaires (or lighting units) themselves to be adjusted at various heights or rotated to any required position to avoid obstructions.

This equipment evolved from a design program conducted for the city by Donald Deskey, a leading industrial designer, and from the engineering and development work of several companies. Units based on the new concept are being considered by Armand D'Angelo, Commissioner of Water, Gas and Electricity, as replacements for more than 64,000 cast iron lamp posts in the city.

The Metallurgical Laboratories of Olin Mathieson Chemical Corp. developed a process for adhesive bonding together two solid aluminum extrusions to form a lighting column. This design assistance and technical aid ultimately led to a product that would fulfill the lighting and traffic needs of the country's largest city at a considerable saving compared with conventional aluminum lighting columns.

Circular, tapered aluminum poles, widely used for street lights, overhead sign supports, stadium floodlighting, etc., are produced from seamless one-piece hollow extrusions which have been tapered by spinning to form longer poles of uniform wall thickness throughout their length. In Canada, octagonal tapered aluminum light standards have been made by welding longitudinal joints of formed sheet.

The new multi-purpose pole design originally specified a one-piece hollow extruded shaft, plus a base casting, cap, and fixtures for arms and luminaire—all of aluminum. Olin's Metallurgical Laboratories were requested to provide design and technical assistance during the initial stages of the project.

Their product development group suggested that the original one-piece 17.5-foot aluminum column be replaced by a less costly shaft consisting of two solid extrusions joined together.

Aluminum extrusions may be solid, semi-hollow or hollow. A solid extrusion has no void or hollow in any part of the cross section. A semi-hollow extrusion has a partially enclosed void. A hollow extrusion is one in which there is a void or hollow in any part of the cross section.

■ *This is the light standard, made from two solid extrusions bonded together, which might replace more than 64,000 cast iron standards in New York City.*

Prices of aluminum extrusions vary. Solid sections cost less than hollow shapes, due to the more expensive dies, greater die wear, slower extrusion rate, and greater difficulty in maintaining tolerances on hollows.

There is an obvious economic advantage in making tubular structures from solid shapes if a sufficiently inexpensive joining method can be used to fasten two solid extrusions together. The joining process had to provide sufficient joint strength to meet structural specifications, service life requirements and appearance standards, plus decided cost advantages.

Three methods of joining were investigated—mechanical fasteners, welding, and adhesive bonding. Welding and adhesive bonding provide the desired service life, structural integrity and appearance, and it was decided after a thorough investigation that adhesive bonding would give the largest economic advantage.

Joining with adhesives proved to be inexpensive enough in this application to produce overall savings of up to 10% by using solid aluminum extrusions instead of hollows. And epoxy adhesives have been used long enough to confirm that they provide the necessary service life.

Structural specifications required the light standard to withstand a uniform wind load of 37.5 lbs./ft. over the entire projected surface area of base, shaft, two arms, and two luminaires. This is equivalent to a wind velocity of about 122 mph, perpendicular to the projected flat surface area of the column and all the components. This is well above the 100 mph usually specified.

The Metallurgical Laboratories first modified the original design to take advantage of the extrusion process and

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1. Coolant kept out of bearings by non-rubbing, large capacity gutters. Oil contamination and roll end face wear eliminated.

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NEWS FROM
LOMA

After an initial "breaking-in" period, this large LOMA slab casting and sawing installation is now in full production at the aluminum sheet rolling mill of the Quaker State Metals Company, Lancaster, Pa., a division of Howe Sound Company. Capable of producing six 7½ in. x 52 in. x 144 in. aluminum alloy slabs simultaneously, the LOMA semi-continuous casting machine turns out all the ingots required for the processing of sheet, strip and coil. From a quality point of view these continuously cast slabs are greatly superior to those formerly cast in conventional book molds, particularly since one of the methods by which the grain size of the cast material can be controlled is by regulating the casting speed.

For subdividing and trimming the 12 ft. long sheet ingots, Quaker State has also installed a LOMA high-speed circular saw capable of cutting through a 12 in. x 52 in. aluminum alloy section in about one minute. The sawing machine is of the overhead sliding carriage design and employs a 48 in. diameter blade cutting at a speed of 6000 ft. per min. The sawing installation includes a slab charging conveyor, an automatic length stop, a slab discharge conveyor and a chip removal unit. This fully mechanized stock handling equipment combined with the extremely fast feed movement of the saw allows a single operator to run the entire installation at a very high production rate.

LOMA
MACHINE MFG. CO., INC.
114 East 32nd Street
New York 16, N. Y.

the bonding method. The many important cost saving features that were incorporated into the new extrusion included a self-jigging feature that eliminated expensive jigs and tooling, and an adjustment feature that obviated the need for holding tight, costly tolerances on the extrusion and other parts. The result is an adhesively bonded joint design* at a considerable saving over the one-piece extrusion.

The Olin laboratories set up a development program to fabricate and test a full-scale column and base assembly. Adoption of adhesive bonding called for modifications in the shaft, base and cap. Olin's extrusion plant at Gulfport, Miss., produced the extrusions for the new light pole. The base and cap castings were supplied by Oswego Casting Corp., Oswego. N. Y.

Prototypes were constructed by the Hagerstown, Md., plant of Fairchild Aircraft and Engine Division, which has one of the largest adhesive bonding facilities in the U. S. Fairchild also assisted in development and helped choose a suitable epoxy formulation for bonding the two extrusions to each other and to the base and cap castings.

Rubber & Asbestos Corp., Bloomfield, N. J., supplied the adhesive system that was ultimately used. Fairchild provided the facilities and supervision for structurally testing the first models. These tests established that all specifications had been exceeded by an appreciable margin.

Bond Stronger than Metal

Physical tests consisted of applying bending and torsional loads to the shaft and base assembly. These assemblies were tested to destruction. Failure occurred in the metal at its ultimate mechanical properties rather than in the adhesive bond. Tests were conducted in the presence of a representative of a large city's engineering department and other interested observers.

Two prototypes have been in successful service for more than a year in a metropolitan area that has a corrosive marine and industrial environment. To our best knowledge, these are the first all-adhesively bonded lighting standards in the world. They have received favorable consideration from various civic departments.

Attached to the prototypes are dummy apparatus representing call boxes for police and fire departments, street signs, and traffic control equipment. Commissioner D'Angelo estimates that the new posts, equipped with mercury vapor lamps, will provide up to 250% more illumination.

Adhesive bonding has been used for

*Patent applied for.

View of the bonded Olin aluminum shaft being subjected to a rigorous bending test at Fairchild Aircraft & Engine Div'n. Tests established that the pole easily exceeded all specs including equivalent of 122 mph wind test.

over 15 years to bond together large aluminum surface areas and major structural parts of aircraft. In Convair's supersonic B-58 bomber, 95% of the surface area is adhesive bonded. More than half of all structural parts of Fairchild's F-27, which is used by American and foreign airlines, are bonded. Aircraft demand a high degree of dependability, and adhesives have proven equal to the problem—particularly when fatigue resistance is important.

Epoxy resins are used in an increasing number of other structural applications. In Europe, they were used to fabricate an aluminum footbridge 32.8 feet long and 8.7 feet wide. Epoxy adhesives are used to join prefabricated roadside curbing sections that are installed at the construction site and save the expense and time involved in preparation and removal of wooden forms. Adhesive bonding of rails on the New York subway system provides more serviceable joints at lower cost than can be obtained by welding.

For esthetic purposes, adhesives can be pigmented with any desired color from metal tones to bright hues. Bonded assemblies can be anodized without affecting bond strength or appearance. Adhesives also offer wide flexibility in design, requiring no significant revision in production bonding procedures if design changes are warranted.

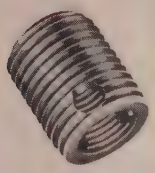
The use of street poles for supporting signs, control boxes, and other traffic control equipment, as well as lighting fixtures, typifies the progressive action being considered in many cities.

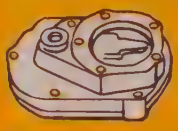
The concept of adhesive bonding aluminum components offers city engineers and architects an approach for more economical use of aluminum in street lighting and other applications where aluminum's unique properties can be exploited.

The quickest most practical way to put strong threads in soft materials the TAP-LOK® INSERT

FOR SOFTER METALS AND PLASTICS . . .

Slotted TAP-LOK insert has full V-form external threads to provide maximum locking torques; permit wide choice of mating hole sizes. Recommended for soft aluminum, zinc die castings, sand castings, and plastics. Meets requirements of MIL-MS 35914.





FOR HIGHER STRENGTH MATERIALS

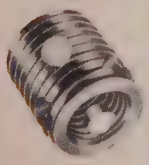
H-Series heavy-walled TAP-LOK insert has truncated root external thread and three-hole cutting edges for hard-to-tap higher strength materials and to meet MIL and other specs calling for Class 3B thread fit for gaging after installation.

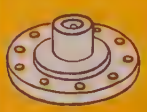
FOR SPARK PLUG SOCKETS . . .

P-Series TAP-LOK insert was designed to eliminate thread wear and renew damaged threads in spark plug sockets in aluminum cylinder heads. Available from stock for standard plug sizes to meet most needs.

FOR WOOD . . .

W-Series TAP-LOK insert has coarse pitch external thread offering maximum strength in combination with ability to be driven into thin sections without splitting them. For furniture, cabinets, and other wooden parts where strong, permanent threads are needed, or which must be frequently assembled and disassembled.





FOR LOCKING THE MATING SCREW . . .

N-Series Tap-Lok Insert has Nylok pellet embedded in threads to make internal threads self-locking. Ideally suited for adjustment screws and applications involving severe shock and vibration. Meets requirements of MIL-N-25027 (ASG).

The TAP-LOK® threaded insert taps its own thread and locks itself into the parent material in a single, quick operation. Designed as a permanent fastener in materials which are machinable but not strong enough to sustain applied loads in threads tapped directly into them, it is also widely used in harder metals and alloys where repeated assembly makes thread wear a problem.

Since TAP-LOK cuts its own threads, no additional assembly time is required, *making its installed cost the lowest of any threaded insert!*

Once installed, it is permanently locked in place, and will not back out under repeated heavy shocks or prolonged vibration. TAP-LOK inserts are available in the types shown at the right, in a variety of metals that include casehardened carbon steel, brass and 18-8 stainless steel (type 303). For complete information and prices, write Groov-Pin Corporation, 1123 Hendricks Causeway, Ridgefield, N. J.

TAP-LOK

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SEE OUR CATALOG IN SWEET'S

Aluminum Tariffs: Pro and Con

U. S. Tariff Commission, in preparation for GATT meeting in Switzerland, hears opposing views of Aluminium Ltd. and U. S. primary producers.

"No Tariff Needed"—Aluminium Ltd.

THE United States tariff on imported crude aluminum is unnecessary and unjustified, according to Aluminium Sales Limited, sales subsidiary of Aluminium Limited. The firm's president, Eric West, recently argued this point to the United States Tariff Commission and Committee for Reciprocity Information.

West's prepared statement consisted of five general points. Point 5 states, in effect, that eliminating, or at least paring the 1¼ cent tariff per pound as much as the law enables, "is in the public and national interest." The first four points supported this argument.

In Point 1, West asserted that the U. S. aluminum industry has enjoyed, and will continue to enjoy, "phenomenal, dynamic growth." He cited figures showing that production has almost tripled during the period from 1950 to '59 (from 718,622 tons to 1,953,017 tons), and that capacity has more than tripled in the same period (from 749,750 tons to 2,336,050 tons).

Other evidence of a growing industry, as noted by West, included: The continual development of new aluminum products and markets; a rise in the cost per pound of aluminum from 16 cents in 1949 to the current 26 cents; the expansion of the industry's Big Three into some 16 countries located on every continent; and the sharp rise in U. S. exports — from less than 700 tons in 1950 to almost 6000 tons in '55 and to more than 225,000 tons in the first nine months of 1960.

Point 2 explained that though production has climbed rapidly, it has not greatly increased the supply of metal available to non-integrated fabricators. According to West, most of the increased capacity was intended to provide the primary producers with more metal for their own fabricating facilities, to fulfill hot metal contracts with auto makers, and for export and foreign interests.

With much of this increased production slated for these channels, West reasoned, the possibility arises that there won't be enough metal for small, non-integrated fabricators.

Point 3 merely pointed out that in the past, when production capacity was lower, imported metals guarded against material shortages. Parts 4 and 5 continued this theme, and stressed the importance of preventing shortages.

According to West, "the projected further increased demand for primary metal throughout the world requires encouragement of a continued available supplementary supply of imports into the United States, particularly from Canada."

Each of his five points was in support of an argument.

First, the figures shown and statements read were to prove that the U. S. aluminum industry is indeed a growing and healthy one.

Second, the increased capacity of the primary producers does not eliminate the possibility that small, non-integrated fabricators will, at times, face metal shortages.

Third, eliminating or reducing tariff payments would encourage imports, which are vital to the further growth and expansion of the U. S. aluminum industry.

Fourth, since the industry has grown so rapidly in the past 10 years, there is no need for a protective tariff.

Fifth, it will be in the national and public interests to guarantee all aluminum users in the United States a continual source of metal regardless of business cycles, etc.

"Don't Lower It"—U. S. Producers

THE six U. S. primary aluminum producers prepared joint statement favoring the retention of current tariffs imported crude aluminum.

Three representatives were chosen, each to discuss special facet of the aluminum industry. Frank L. Mag of Aluminum Co. of America, covered capacity expansi Richard S. Reynolds, Jr., Reynolds Metals Co., detai market development; and Charles A. Macfie, Revere C per & Brass, Inc., dealt with the impact of imports on r domestic producers.

Magee confirmed the healthy growth the U. S. indus has enjoyed in the past 10 years. But he also pointed that currently 800,000 tons of primary domestic capac are idle. This has resulted in unemployment of min dock workers, etc., as well as layoffs in chemical refine and electrolytic smelting plants.

"In view of current idle capacity and unemployment still lower U. S. tariff on primary aluminum is not ju fied," concluded Magee. He urged instead that the gove ment insist that foreign aluminum-consuming countr lower their tariffs to the U. S. level. This, plus continu research and development would help expand world a minum consumption.

Magee's statements were in direct rebuttal to Aluminiu Limited's claim that non-integrated fabricators could fa metal shortages unless imports were encouraged. If 30 of capacity is idle, Magee contended, there is ample roo for increased demand from any consumer. He also plained that through the use of coal, lignite and gas power reduction plants, capacity can be increased rapid

Richard S. Reynolds, Jr., claimed that aluminum m kets are man-made; that aluminum has always had compete with already accepted materials for usage in n products. In expanding aluminum consumption, Reyno explained, "the primary producers, more than any oth group, have provided the funds, the manpower, the ski and the sheer drive required."

He then noted that new markets are becoming mo difficult to shape; that primary producers' earnings slipp steadily in the past four years. He urged that other mark be concentrated upon, pointing out that per capita use aluminum in this country is 23 pounds, compared to on 9 pounds in the rest of the industrially developed fr world, and only 1/3 of a pound in the underdevelop free world.

This potential is so vast, Reynolds claimed, it is vit to the future growth of the worldwide aluminum indust that it be sought after — but this requires men and mone

The manpower exists at the primary producers, b money will only come from increased earnings.

"Earnings and market development would not be in proved by increasing the flow of foreign aluminum in U. S. markets," Reynolds asserted. He reiterated that th domestic market is amply supplied, and explained th encouraging unneeded imports would only impede mark development since it would necessarily reduce earnin needed to finance efforts to up free-world consumptio

Revere's C. A. Macfie noted that a lower tariff woul stimulate imports and that the new and relatively sma producers would be hurt most by increased imports. Reve and Olin Mathieson Chemical Corp. jointly own Orm Corp., one of the new primary producers.

Are YOU cashing in on the BOOM in VINYL COATED ALUMINUM?

't's your market... Jump in and get your share!

ur profits will soon make sweet music—if you get into the fabrication vinyl coated aluminum siding right now! Builders and building supply alers have put it in high demand because consumers trust vinyls—ınt the maintenance-free protection of vinyl coated siding.

It's a spiraling market. In 1960, residential siding called for some 0,000,000 square feet of strip coated aluminum—a 50 per cent gain over 59. Builders now know that it sells more homes faster. Gets their oney out sooner. Building supply dealers, too, are on the bandwagon cause turnover is fast!

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Union Carbide Plastics is telling your customers the vinyl coated alu-num story through ads in *Better Homes & Gardens 1961 Home Im-ovement Ideas Book*, and *1961 New Homes Idea Book*. Ads are also pearing in *House & Home*, *Building Supply News*, and *Building ecialties*.

Get into this growing market. Investigate and evaluate vinyls! See ur coatings suppliers, or contact Union Carbide Plastics Company, ivision of Union Carbide Corporation, 270 Park Avenue, New York , N.Y. *In Canada:* Union Carbide Canada Limited, Toronto 12.

HERE ARE THE EXTRAS YOU GET WITH VINYL COATINGS

- Longest exposure record of any finish for aluminum—over 11 years on actual houses without need of repainting.
- Superior formability, even after aging, because of its inherent flexibility.
- Excellent corrosion and chemical resistance.
- Excellent pressure marking resistance.
- Proper formulations will not mildew.
- Low cost.
- Proper gloss level without sacrifice of durability.

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LUMINUM SHEET

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HOME BUILDERS BULLISH AS EVER

Last year was no picnic for the home builders, but huge convention and trade show of the National Association of Home Builders revealed programs calculated to give the industry a much needed "shot in the arm." Starts in 1961 could reach 1.3 million. Aluminum applications plentiful at the show.

by H. K. Darby, Associate Editor

A GROGGY but determined home building industry plans to fight harder for consumer dollars this year. Its score of 1.2 million starts last year was 19% under the '59 total, and even this past January's starts trailed the January, 1960 figure. But perennially optimistic home builders believe they will regain *some* lost ground in 1961.

"Nineteen sixty-one business has been slow to date," Donald M. Dailey, director of research of the U.S. Savings & Loan League, said, "but I wouldn't be at all surprised if total starts were to reach one and one-third million."

If the National Association of Home Builders has its way, that much-ridiculed term, "The Soaring Sixties," will still have meaning for the home building field. On the basis of the anticipated population increase, a minimum of 16 million new homes will be needed during the next ten years. But NAHB doesn't think the builders should be satisfied with a normal increment, and has begun a high-powered promotion program which it hopes will boost new home sales by a quarter of a million starts annually.

The program was spelled out at the Association's 17th annual convention and trade show which ran for five days in January and February at Chicago's McCormick Place. Simply explained, "HIPO" (for Housing Industry Promotional Operation) is designed to put a new home in Mr. Consumer's acquisitive eye instead of the usual new car or boat. Fuller & Smith & Ross, Inc., national advertising agency, is handling the program.

Meanwhile, the builder will have several other developments working for him this year, stemming either from government or NAHB effort. They tribute to an improved climate for home building and buying.

It was the NAHB's Builders Econ Council whose projections prod the figure of 16 million home start the next decade. John M. Dicker the Association's executive vice p dent, quoted a BEC survey w spotted a trend toward more homes in the $10,000 to $12,000 ra

The Council is made up of buil who are considered to reflect the w industry. This group, Dickerman plans to increase their productio this price class by 32%. While "g ally moderate increases" are expe in the cost of labor, land and deve ment in 1961, he added, many buil hope to hold down the price of h by applying improved building t niques and using cost-cutting com ents and new materials.

Home builders across the cou have shown greatly increased int in building codes, according to W Buzzell, assistant director of NA technical services. The Association pushed efforts to remove out-of-d restrictive codes and to replace t with more realistic ones.

"Home builders in Houston, waukee, Springfield (Mo.), Pittsbu St. Louis, Cedar Rapids and De are among those who can testify laborious study and exploration either has paid off or is about to rewarding dividends," Buzzell said.

The freer flow of mortgage mo in the second half of last yea expected to hold in 1961, accordin J. Stanley Baughman, president of Federal National Mortgage Associat He listed the following main causes this easement: A decrease in con tional loan interest rates; long t investors are now actively seeking m gages; FHA and VA mortgage disco are continuing to decrease; savi

■ ***Anchor Post Products Inc., Baltimore, maker of this line of aluminum privacy fencing, says it gives development homes a custom-built appearance. The pre-enameled aluminum needs only an occasional hosing to keep it clean.***

EXTRUSION DIE STEELS PRESS PARTS

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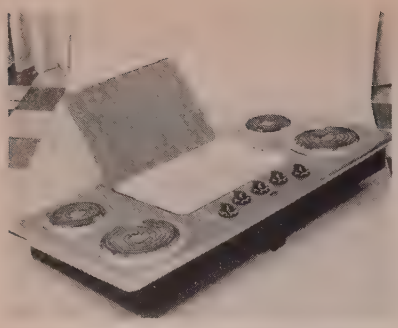


Stoves made by Thermador Electrical Mfg. Co., Los Angeles, use aluminum for built-in griddle (above) and filter frame in cooking exhaust hood (below). Broiler trays are also aluminum.

available for long-term home financing, are continuing to grow at a rate which exceeds by far the number of mortgages currently being made.

According to Baughman, total savings inflow to the nation's savings and loan associations, life insurance companies and mutual savings banks in the month of November, 1960 was $1.2 billion—about 25% more than in that month in 1958 or '59.

Even if NAHB promotion efforts were fruitless, a "normal" building year would call for increasing consumption of aluminum in a wide range of home building products. Reynolds Metals Co. surveyed the show and figured that the building supply industry there exhibited more than 500 product lines which use aluminum.

"Products included awnings, columns, screen and storm doors, gutters and downspouts, hardware, insulation, light fixtures, outdoor light posts, louvers, railings, registers and grilles, roofing, roof vents, shutters, siding, soffit and fascia, thresholds, windows and shower enclosures," Reynolds said.

But perhaps the most important aluminum development in home building made the show only by proxy. It was an announcement of construction of a $250,000 house near Detroit, the first to have an all-aluminum structural frame. An added feature is the ability to assemble this framework with a hand wrench, screw driver, bolts and screws.

The home is being built by David N. Insley, president of Fisher-Insley Corp., Detroit, an aluminum building products firm. The architectural firm of Greimel and Morris, Detroit, designed the home, which uses a system of pre-cut modular extruded aluminum structurals which can be quickly fabricated into any suitable concept by an inexpensive assembly system under guidance of an architect.

Insley said that the strong, durable frame makes it economically feasible to expand or contract a home to meet family needs, and enables a builder to take advantage of architectural opportunities offered by varying sites. Such a home, he said, could even be dismantled for removal to another location.

Beyond the Fisher-Insley home, there wasn't much that could be considered startlingly new in the way of aluminum home building applications at the NAHB show.

Emerson Electric Mfg. Co., St. Louis, has for years been a substantial user of aluminum. Seven out of 11 new Emerson-Pryne range hoods are aluminum in copper and clear anodized condition.

"Our ceiling fan grilles are made of aluminum, as are the grilles of our oscillating fans," an Emerson engineer said. "Aluminum is easy to fabricate. The fact that it weathers well explains why we use it for our outdoor lighting brackets."

For Any New Home . . .

A new product of Alcoa is its aluminum soffit and fascia, designed to eliminate the collection of moisture under roof overhangs. According to C. J. Land, president of the newly organized Alcoa Building Products, Inc., roof overhang measures from two to three feet "for practically every new home built in the U. S. today."

"The importance of this application becomes more evident," Land said, "when one considers that with aluminum siding, windows, doors, screenings, soffit, fascia, rain-carrying equipment and roofs, all now on the market, a builder can completely enclose the exterior of a house in the light metal at costs competitive with current materials. With most of these items prefinished, building costs are cut and future maintenance is practically eliminated."

The builder has a choice of five variations of soffit sheet, and four fascia designs. Soffit pieces are made in perforated and non-perforated styles, in widths of 24 and 36 inches, and pre-painted in white Alumalure, Alcoa's baked enamel finish. The system also includes a complete line of accessories.

The soffit features a non-glare stu pattern, is ribbed for maxim strength between rafters. Perforati are ⅛-inch diameter on 21/64-i staggered centers. The perforated sc sheet contains 14% open area.

Both the soffit and fascia are desig to be used with any style of roofing, a may be interlocked with Alcoa sid and gutter and downspouts.

Hardwick Stove Co., Clevela Tenn., uses embossed aluminum outer panels on all its built-in ove brushed aluminum for oven lining a bottom plates; and shallow drawn a minum for door linings. All alumin used is 20 to 24 gauge.

Price Conscious?

"Business became good after a sl start in 1960," a Hardwick salesm said. "We are trying to move out a medium price market into the hig priced field."

An RCA-Whirlpool man said t "all shelving in our refrigerators aluminum. Drip pans are aluminu too. Kickplates of our washers are bossed aluminum because of its ex rigidity and its ability to ma scratches."

Bryant Mfg. Co., Indianapolis, In manufacturer of water heaters, gas a oil burners and baseboard heating a air conditioning systems, uses alumin for fan blades because the metal light and requires no painting. Mech isms of the gas heaters and air con tioners have spun aluminum caps a shallow drawn covers.

However, Bryant eschews alumin in the water heaters, preferring gl lined steel because "you drink wa out of glass tumblers, and we feel t because of this glass has a better sa angle." Our informant at the Bry booth also said that "glass will han any area's water."

"Business was up over '59, last ye though not as good as we had hope he said. "Basically, our industry follo the building trend, and building v down 15% in '60."

An interesting phase of NAHB Sh coverage was the range of opinions the builders themselves when quer about aluminum's prospects.

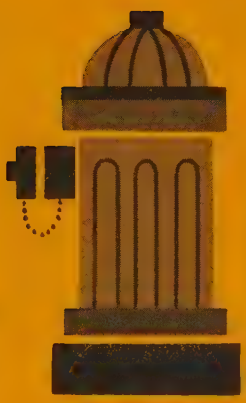
R. H. Foster of Dallas, Tex., pl to use porcelain enameled alumin bathroom tile in his $18,000-class hom but was dubious about aluminum s ing.

"Where I am, wood shingles a brick are best for this price bracke Foster said. "I just haven't noticed a minum siding in my area. The windo though are mostly aluminum."

Ivan Love, Hiawatha Homes, Sy cuse, N. Y. said that his area was

from Spark Plugs

to Fire Plugs



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■ *Roll formed aluminum frames are used in these by-passing screen doors which help turn garages into comfortable summer family rooms. Garage-Aire is the name for these easily-installed units, made by Raynor Mfg. Co., Dixon, Ill.*

particularly partial to aluminum. "Generally, it isn't accepted quite as rapidly in cold weather areas such as ours as it seems to be in warmer climates," Love said.

Hiawatha Homes, besides being custom builders, have a line of wood paneled prefabs. Love "would be surprised" if they went to aluminum for the prefab panels very soon.

Both men indicated that business was "slow to fair" in their respective areas, but they had high hopes for an improved situation this year.

Aluminum Booster

On the other hand, Fred Wilkens of Miller Builders Inc., Chicago is an enthusiastic aluminum siding booster. "We were one of the first to use aluminum siding in the $24,000 to $30,000 class," Wilkens said. "We think it's one of our top sales features. It offers considerable savings. The people like it."

According to C. M. Swales, Dolphin Homes, Inc., East Point, Ga., "Most of the homes in our neighborhood use brick veneer. One sub-division that uses aluminum siding is experiencing pretty slow sales. It's like a frame house in our neck of the woods: You can't give it away."

"Roofs are of conventional materials, mostly asphalt," Swales added. "I haven't seen one aluminum shingle job. We looked into aluminum shingles around 1956 and we decided not to fiddle with it. Why? Price, I s'pose."

The Georgia builder said that seven or eight years ago wood lap siding was most popular, but that now, brick veneer is the desired siding material, even in the lower price range.

"This past year building in our area was off 35 to 40% from 1959," Swales said. "I've met just one man up here whose business last year was better than '59."

The sales manager of a siding manufacturer predicted that his company would double its 1960 sales this year. Albert Korbin of Wisco, Inc., Detroit, indicated that most of Wisco's sales have been for new homes.

Norman O. Richards, a builder from Fairfield, Conn., and a director of NAHB, said that aluminum siding was popular in the $18,000 to $25,000 class. He builds in the $25,000 to $40,000 range, however, and here he meets resistance. Buyers are afraid the salt water atmosphere will corrode the metal.

Richards said 1960 was a slow year for him, but indications are that '61 will show a gain.

Kenneth A. Alles, Lincoln, Neb., said that business up to show time was brisker than any comparable period he has ever experienced. He doesn't use aluminum siding, and most of it used in this area is for remodeling.

Matter of Gauge, Maybe?

Henry O. Kraft, Town & Country Builders, Cheyenne, Wyo., doesn't like the way hail affects aluminum siding; 15 of some 700 starts in his area last year had aluminum siding, he said, and all of them were badly dented by hail.

Kraft felt that business was good last year, but that business this year would be slow, with only about 550 to 600 starts.

A building products jobber from Charleston, S. C., cited the salt water atmosphere as the reason why aluminum siding just wasn't used in his area. A construction company operator from Minneapolis, who builds homes in the $25,000 to $40,000 range, never uses aluminum siding because "it comes only in 8-inch widths" and so imposes design limitations. He acknowledged however, that customers *do* ask about and that he will use it when a vari of widths becomes available.

Harry H. Batchelor, of James Rouse & Co., Baltimore, mortgage nancing firm said: "People don't li the fact that the kids can dent alu num siding. One very large builder the Baltimore area is the local d tributor of one of the nationally d tributed prefabs. He told me that wo siding costs more but that he is goi back to the wood."

It Reduces Maintenance

A lot of low income families putting aluminum on their cotta to keep maintenance costs down, Batc lor added. He believes that really l income homeowners don't worry abo dents, but that people who pay $18,0 or more for their homes are concern about this threat.

The mortgage man mentioned other trend—that of adding alumin siding to concrete block multiple fam units that sprang up profusely in ma industrial areas during World War "Aluminum has improved their appe ance immeasurably," Batchelor said.

James E. Metcalf, Columbus, Oh said a lot of aluminum siding w being added to old homes in his ar but that it had little or no applicati to new construction. "I think it's cause aluminum is a little more exp sive," he said. Metcalf's firm uses mos brick in its $20,000 to $22,000 hom Metcalf said that business was ve good in 1960 and that they expect to stay good in '61.

James C. Dunlop, of Dunlop Co struction Co., Chicago, said 1961 loo

■ *Marwais Mfg. Div'n, Los Angeles, co its versatile utility building Roomet it's made of stucco-embossed clad alu inum sheet and is made in five sizes to 7 x 10 x 6½ feet high. It is ea to erect with screw driver and pliers.*

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as though it would bring fair business. So did Paul Mendenhall, of R. F. McKenna Co., Indianapolis, Ind., who expects his firm to recover from the effects of a poor 1960.

Carl A. Priebe, a consultant for United Illuminating Co., Bridgeport, Conn., sees a "definite rising trend in building."

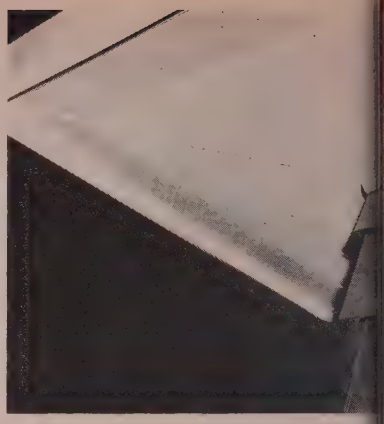
"Sixty-one won't be a boom year, but it ought to be a solid one," he said.

On the other hand, Sam Kestnbaum, area sales manager of Plextone Corp. of America, Newark, N. J., manufacturer of paints and finishes, predicts that "1961 will turn out to be a lot better than most people think."

Sam Sherman, of Seaboard Homes Inc., Beverly Hills, Calif., said that the use of aluminum siding for remodeling is increasing steadily in California, much of which is exposed to salt water atmosphere. Aluminum is optional on the firm's prefabricated houses. Business is good, Sherman reports; the firm expects 1961 to be its best year. Last year Seaboard Homes opened new plants in Texas, California and Ohio.

An estimated 34,000 builders and their wives attended the show, the wives being as interested as their husbands in what was being offered. The NAHB Show might be the only gathering of its kind that the little woman doesn't just come along for the ride and an opportunity to do the Chicago shops. It was pretty obvious that she earned the trip when it came time to put those home appliance salesmen through their paces.

As far as the exhibitors are concerned, they seemed happy with the show, which is obviously an important part of their business life. As one manufacturer put it: "If you don't make this show you lose about 75% of your building market."



■ *Soffit system by National Rollex Corp Elk Grove, Ill., will fit any width ove hang without cutting and fitting. "Alum Soffit Supreme has a frieze mould ing, V-jointed panel and fascia tri without exposed nails. It's made fro heavy gauge pre-painted aluminum.*

The Changing Home Improvement Contracto

The home improvement side of the building products business was brought into focus when NERSICA held its 1961 convention at Chicago's Hotel Sherman the last three days of February. Attendance was heavy and the trade show exhibitors reported high interest on the part of several thousand attending contractors.

On exhibition was a wide assortment of roofing, siding and specialty products: Aluminum lap and vertical siding and asbestos simulated stone and brick siding; aluminum and asphalt shingles; screen cloth; aluminum combination windows and doors; jalousie windows and doors; and aluminum awnings, carports and patio roofs.

Other Products . . .

Other products exhibited included aluminum shutters, gutters, downspouts, soffit and fascia, hardware, decorative metal railing and columns, roll forming equipment, siding cutting tools; fencing and prefabricated panels of various types, and room heating equipment.

The home improvement industry is considered to have an annual consumer dollar volume of about $22 billion, and it is growing fast. Peter H. Johnson, NERSICA president, said that an annual growth increment of $1 billion was well within the realm of possibility from now on.

Thanks to siding, Johnson said, aluminum consumption for home improvement applications has reached record proportions.

"From the standpoint of our own sales effort, aluminum siding is the hottest item in the range of home improvement products," he remarked.

According to those best qualified to judge, the number of contractors handling home improvement work might be between 20,000 and 25,000. They are positive of one thing, however, the trend is toward greater diversification of home improvement service.

"There was a time when roofing and siding people were that and nothing else," one NERSICA man explained. "Now they're branching out."

The contractor who limited himself to insulation work now sells the room addition job, and has the capability of constructing the room as well as installing the subsequent insulation. Room additions call for electrical contractors; it isn't long before they become general contractors.

Window and door people have spread out to fields such as patio building, carport and garage erecting.

The Electric Heating Division of Seaboard Products Corp., Newark, N. J., experienced considerable difficulty in show merchandising its baseboard heating units until it "discovered" the NERSICA Show. The reception accorded Seaboard's "Safe-T-Stat" electric baseboard heaters by home improvement contractors was excellent, according to the Seaboard representative.

Roll Your Own!

Another indication of the changing character of home improvement contractors was the presence at the Show of a roll forming machine manufacturer. Craver Industries, Inc., Charleston, S.C., developed a budget priced roll forming machine exclusively for aluminum siding production. The basic machine and two accessories enable a manufacturer to produce several types of horizont and vertical siding, as well as step-dow awning and carport sections.

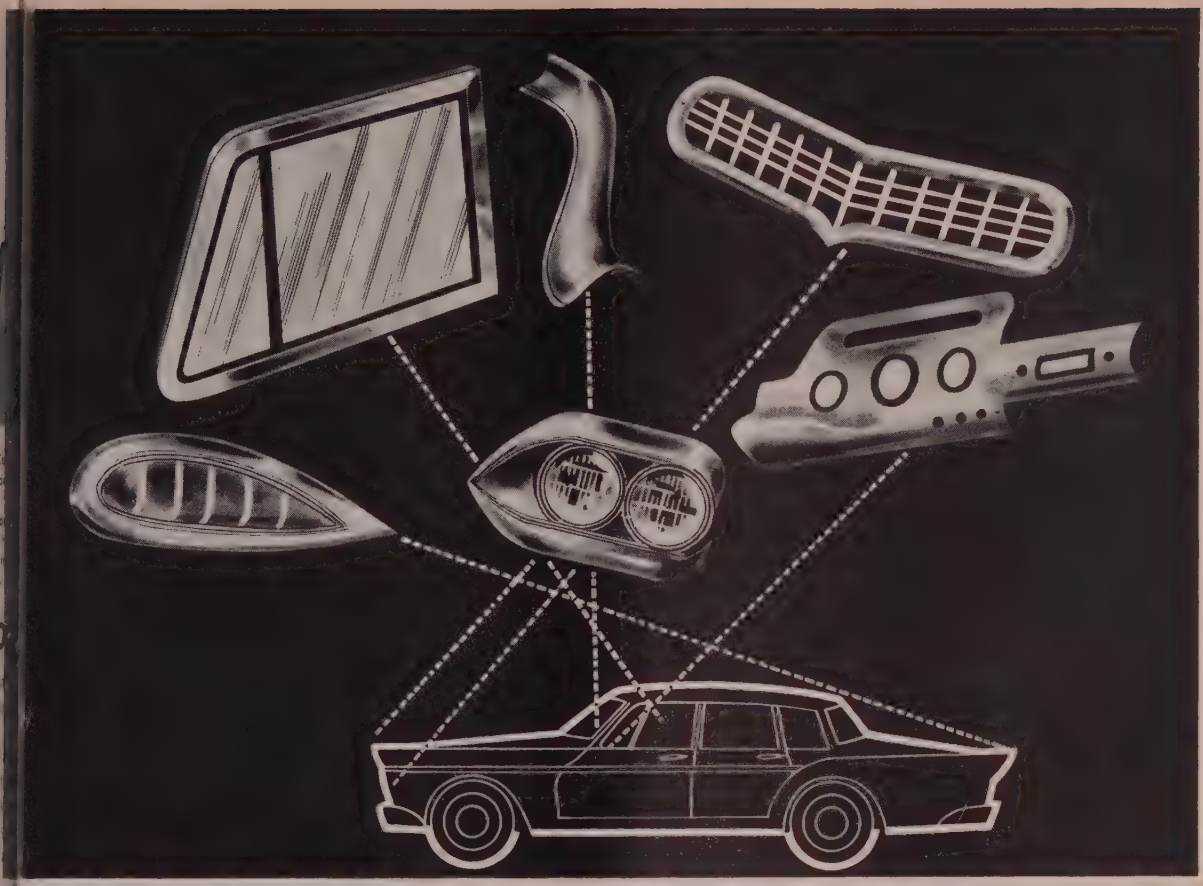
W. E. Craver, Jr., president of th firm, is convinced of the great futu of localized siding manufacture, usin pre-painted aluminum coil. Craver sa that the display of roll formers an actual production of siding at the boo created "tremendous interest" on th part of the home improvement peop

NERSICA takes a serious view t the depredations of crooked contracto "in-and-outers" who have victimiz homeowners to the point where so states contemplate making a license e sential to the conduct of a home i provement contracting business. T Association feels that licensing of co tractors in order to control the ba advertisers and the phoney deal oper tors will only impose penalties on t legitimate home improvement source

Self Policing, Or . . .

"Our industry must clean its ow house," Johnson said. "If the gover ment gives you restrictive licensing, must, in so doing, take away much your freedom to conduct your ow business. We must see to it that eve home modernization contractor engag in practices that are not only abo suspicion, but that will do credit to t industry and serve the public interes

David A. Yoho, general manager Surfa Shield Corp., Scotch Plains, N. and chairman of NERSICA's Legislati Committee, called upon responsible co tractors to take a hand in self-polici programs. He also urged advertisi media and the various lending agenc to do their part in eliminating t fraudulent home improvement contra



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H_3PO_4	85.21%	80.20%	75.26%
Cl	0.0001%	0.0001%	0.0001%
Fe	0.0002%	0.0002%	0.0002%
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As_2O_3	0%	0%	0%

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Part 3: How to Specify and Use Threaded Fasteners

Thread types—selection factors—head types—standard aluminum fasteners—mechanical properties—determining torque—piercing, drilling, reaming of holes—tapping holes—thread inserts—how to select and use sheet metal screws—pneumatic, electric drivers.

by F. L. Church, Senior Editor

APPROXIMATELY one million screws of various types were used last year by American Aluminum Products, Inc., Washington, D. C., in the manufacture of aluminum awnings, jalousies, patio roofs, and storm windows and doors. The company consumed some 800,000 pounds of aluminum sheet, extrusions and tube; expects its aluminum needs to approach the million-pound mark in '61, with its consumption of fasteners rising accordingly.

Down in Houston, Texas, the Heller Co. consumed some 300,000 pounds of aluminum extrusions and used about 400,000 screws and bolts in manufacturing its sliding glass doors. In the same city, Kaiserhof Consolidated, Inc. put about 350,000 pounds of aluminum extrusions and 300,000 self tapping screws into its aluminum patio doors.

These three companies are fairly typical of the 230 aluminum product manufacturers who replied to a Modern Metals survey questionnaire late last year. Some respondents used substantially greater quantities of metal and fasteners; others used smaller amounts of both.

But a characteristic shared by the great majority of the respondents is the use of threaded fasteners. Of the 223 firms that reported types of fasteners used, nearly 79% said they used screws, and 54% specified bolts.

Products manufactured included home appliances, aircraft, missiles, boats, toys, signs, billboards, electrical and electronic equipment, windows, doors, awnings, blinds, screens, medical apparatus, photographic equipment, furniture, automobiles, trucks and trailers, mobile homes, utensils and other housewares, fans and blowers, power mowers, conveyors, and many others.

In short, standard threaded fasteners appear to be standard equipment in nearly the full spectrum of products made, in whole or in part of aluminum. With this as our backdrop, we will try to explain why and how such fasteners are used to assemble aluminum products.

Our emphasis will be on the functional side of fastening—useful shop data rather than the complexities of thread terminology, fastener standards, and the like. That type of information is available from the primary aluminum producers, from many of the larger manufacturers of fasteners, and from the American Standards Association, the Industrial Fasteners Institute, and government agencies such as the National Bureau of Standards.

A Word About Threads

It will be sufficient for our purposes to note that fasteners are available in various thread series, but that the important ones under the Unified and American Standard are the Unified Coarse Thread (UNC) and the Unified Fine Thread (UNF). The coarse series is far more common, being used for general applications throughout the metalworking industry. The fine series is for more exacting work, as in aircraft construction, etc.

Tolerances of threads are also standardized, with Class 2A (external threads) and Class 2B (internal threads) applying to the great majority of screws, bolts and nuts. Classes 3A and 3B apply to tighter fitting work.

Thus, this discussion will deal primarily with standard fasteners of the coarse series, manufactured to 2A and 2B tolerances.

Although our subject is standard fasteners, we will make occasional excursions into the "specials" category in order to give a more complete discussion of specific techniques. And since washers are so closely associated with screws and bolts, we will consider several of these non-threaded auxiliary fasteners.

On the other hand, some types of standard fasteners will not be discussed. There are nearly half a million of them—identified by type, name, size and material—and many types are rarely if ever used in the manufacture of aluminum products. We'll confine ourselves largely to machine screws, tapping (sheet metal) screws, cap screws, machine bolts, standard nuts and washers, and some threaded inserts.

Special fasteners in these and other categories will be covered in Part 4 of this series of reports (April issue).

CASE HISTORY: Screw Fastening Lawn Furniture

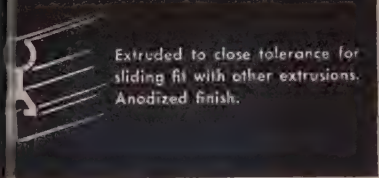
Air-powered screwdrivers are used to drive some 20 million screws a year into the aluminum lawn furniture made by Lawnlite Co., Hialeah, Fla. The firm uses from 50 to 200 aluminum screws per unit. The screws, supplied by Alcoa, are 10 x 5/8-inch Phillips round head sheet metal fasteners with pilot points. They are used to fasten nylon webbing or slats (above) to aluminum tubular framing. In producing chairs, one operator is able to completely web a unit in 3 minutes using an air screwdriver. Before Lawnlite installed its 150 Aro Air Screwdrivers, it took an operator a half-hour to web a chair.

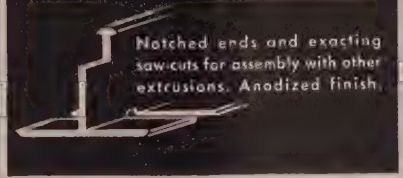
Which Fastener for You?

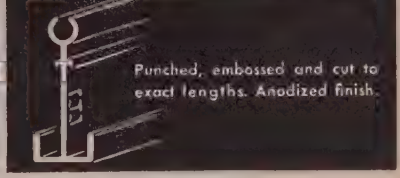
The selection of the best fastener for a given application is subjected to so many variables that it is well nigh impossible to establish general rules. Obvious criteria include cost, appearance, joint strength, and size of production runs. Less common ones may include resistance to severe vibration or an especially corrosive environment; the need for a water- or air-tight joint; or special factors such as electrical conductivity, heat resistance, or magnetic properties.

If high holding strength is needed, machine screws or bolts would be better than sheet metal screws. It would also be wise to shun these self-tapping fasten-

when you design a new product, remember...







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ers if the product must be dismantled and reassembled periodically.

On the other hand, sheet metal screws are often ideal for high-speed assembly because they tap their own holes. And since nuts are not needed, they simplify design by permitting blind assembly.

Selection of head style may be governed by appearance desired, torquing strength needed, driving method to be used, type of material to be joined, etc. A slotted head screw can be driven to its maximum torque limit with little end pressure, provided the right size screwdriver is used.

Recessed heads such as Phillips may need greater end pressure, but are better adapted to high-speed driving. They also look better. Appearance is usually the factor that favors use of countersunk fasteners. The Jackson screw, with its small, unobtrusive oval countersunk head, is frequently used when an inconspicuous fastener is wanted.

Use of round head screws might be dictated by space limitations — close to a flange, for example. If a large bearing area is desired for fastening soft materials to aluminum, try a pan head or truss head screw. But don't expect the latter to carry heavy tensile loads; it could shear through the head.

The bigger the diameter of a screw or bolt, the greater the torque needed to exploit its optimum clamping force. Since high torque values are not easily achieved with screwdrivers, the larger size fasteners usually have hex heads so that they may be wrenched up tight.

Whatever the fastener or head style, however, a good starting point is the now-familiar axiom: *Fasten aluminum with aluminum fasteners.* Most standard screw fasteners, and many specials, are available in aluminum. They are economical; they avoid the problem of galvanic corrosion; their color blends well with the aluminum parts; and their mechanical properties are more than adequate for most aluminum assemblies.

In some instances, an aluminum fastener may not be available to perform a specific job. The alternate choice is usually cadmium plated steel or stainless steel. It's good practice to use nonmetallic washers or protective coatings to insulate dissimilar metals, especially if the assembly will be subjected to a corrosive environment.

Fastener Cost: Up to 20%

Another point worth remembering is that fasteners themselves rarely account for more than 20% of total fastening cost. With labor and other assembly costs eating up the other 80%, it is this area that offers the best opportunity for trimming costs without sacrificing quality. A cheaper fastener can be more costly in the long run.

Standard aluminum screws and bolts are available in the head styles illustrated and briefly described in Fig. 1. These heads, either slotted or with the familiar Phillips recess, account for the great majority of screws and bolts found in general applications. Others, such as carriage bolts, socket screws, and finishing head machine screws, are also standard in aluminum.

Most standard aluminum threaded fasteners are produced in alloy 2024-T4 which provides the best combination of corrosion resistance and mechanical properties. Certain nuts and washers are standard in other alloys.

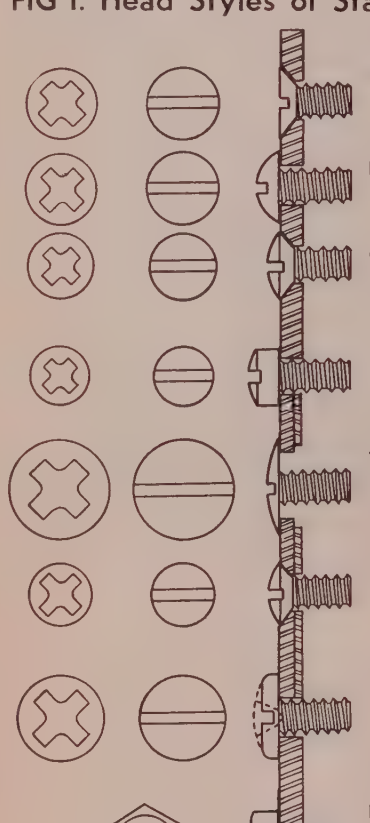
The common barrel tumbled "bright finish" compares favorably in appearance with a high quality nickel plate; makes aluminum fasteners the favored type for plastic, wood, and other nonmetallic products, as well as for aluminum assemblies.

Most fasteners can be ordered in the anodized or Alumilite finish, which costs about 15% more but is superior in corrosion resistance. Anodized coatings may be colored for decorative purposes. For exterior applications, Alcoa's Architectural Alumilite coatings offer the additional advantage of colorfast hues.

Most aluminum screws and bolts have cold rolled threads. This process produces a generally stronger thread, owing to work hardening of the material and the flowing of grain structure to the thread contour. Also, residual compressive stresses are induced by rolling, thus improving the fatigue strength of cold rolled threads. The threads of standard aluminum nuts and some screws and bolts are machined.

Machine Screws — Standard aluminum machine screws are produced in round, flat, oval, truss, fillister, pan, washer, Jackson, and finishing head styles. Sizes range from No. 2 (.086-inch diameter) to ⅜-inch, except for Jackson and finishing head screws, which are

FIG 1. Head Styles of Standard Aluminum Fasteners



FLAT: Standard 80-82° countersunk. Used for flush surface.

ROUND: Most common type. Deep slot permits high driving torque.

OVAL COUNTERSUNK: More decorative than standard flat head.

FILLISTER: Smaller bearing area, deeper slot than round head. Sometimes used in counterbored holes.

TRUSS: Large bearing area; shallow slot. Not as strong in tension as other types.

LENTIL: Also called Jackson head. Similar to oval, but smaller diameter, less conspicuous.

PAN: Large bearing area. Higher edges give greater driving torque than truss head.

HEXAGON: For high wrenching torque, usually on larger screws and bolts. Finished hex head (not shown) is washer faced.

WASHER: Conventional round head with integral washer face combines high driving torque with large bearing area.

Illustration by Central Screw Co., Chicago

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Table 1: Nominal Dimensions of Regular Machine Bolts

Bolt Dia. & Threads Per Inch*	Diameter at Root of Thread In.	Gross Area in Shank Sq. In.	Area of Root of Thread Sq. In.
1/4—20	0.1850	0.049	0.027
5/16—18	0.2403	0.077	0.045
3/8—16	0.2938	0.110	0.068
7/16—14	0.3447	0.150	0.093
1/2—13	0.4001	0.196	0.126
9/16—12	0.4542	0.249	0.162
5/8—11	0.5069	0.307	0.202
3/4—10	0.6201	0.442	0.302
7/8— 9	0.7307	0.601	0.419
1— 8	0.8376	0.785	0.551

*American National Coarse Threads

from No. 4 (.112-inch) to ⅜-inch. Lengths usually run from 3/16 to 3 inches, but screws up to 10 inches can be obtained.

Wood Screws—Normally employed in wood products, aluminum wood screws are best for attaching aluminum sheet, extrusions, hardware, etc. to wood. Produced in slotted and Phillips styles of round, flat and oval heads, they are available in sizes from No. 3 (.099-inch) to No. 16 (.268-inch), and in lengths ranging from ⅜ to 3 inches. Greater lengths can be ordered.

Machine Bolts—These heavy-duty fasteners are usually used in conjunction with nuts to develop maximum clamping force in assemblies requiring high strength in tension as well as in shear. The hex head is standard in aluminum. Regular hex head bolts are not washer faced; are produced in sizes ranging from ¼ to 1-inch in diameter and in lengths of ½ to 6 inches.

Finished hex head bolts, also called cap screws, have a machined washer face under the head, and are used where the bolt head must seat against a spot faced or finished surface or where it is necessary to tighten the bolt instead of the nut. They are also used in tapped holes, in which event the tapping procedure described later should be followed.

Standard aluminum hex head cap screws are made in sizes from ¼ to 1-inch and in lengths varying from ½ to 6 inches.

In many applications, trimmed hex head bolts may be replaced by recessed hex head bolts. Standard sizes are from No. 10 (.190-inch) through ¾-inch, with lengths ranging from ½ to 4 inches.

Sheet Metal Screws—Also called tapping screws, these are probably the most popular threaded fasteners for metal. Of the 230 companies that answered Modern Metal's fastener questionnaire, 66% reported using sheet metal screws.

Standard aluminum sheet metal screws are produced in slotted and Phillips heads in the round, flat, oval, truss and pan configurations. Types include gimlet point (A) for lighter sheet gauges, and blunt point (B) for heavier sheet gauges and for fastening sheet to extrusions and castings.

Standard sizes range from No. 2 (.086-inch) to No. 14 (.242-inch). Lengths are from ¼ to 2 inches in the A-type; from 3/16 to 2 inches in the B-type. The application of sheet metal screws is detailed later under "High Speed Fasteners."

Nuts and Washers—There's a standard aluminum nut for every standard aluminum screw and bolt. Types include square nuts (with or without chamfered top); chamfered and washer faced hex nuts for either bolts or screws; hex machine nuts with chamfered top; hex aircraft nuts (chamfered and washer faced); hex aircraft jam nuts (chamfered top and bottom); hex aircraft castle nuts (washer faced); hex aircraft shear nuts (chamfered and washer faced); acorn nuts; and wing nuts.

All are in 2024-T4 alloy, except the hex finished bolt nuts, which are produced in the more corrosion-resistant 6061-T6. Threads of the aircraft nuts are machined to Class 3B medium fit; the rest are Class 2B free fit. The most commonly used type are finished hex nuts, washer faced to seat against finished or spot faced surfaces. Square nuts are all but out of style.

Aluminum flat washers are produced in 1100-H18 alloy for general applications involving light stresses or where slight deformation is desired; and in Alclad 2024-T4 for uses requiring high strength and stiffness. They are available in both light and regular thickness series for screw and bolt sizes ranging from No. 3 to 1-inch nominal diameter.

Standard spring lock washers (7075 T6 alloy, etched finish) are produced for screw and bolt sizes from No. 2 to 1-inch diameter. They are used to secure a joint against vibration.

Hollow countersunk finishing washers are stamped from 5050-F alloy in sizes suitable for screw sizes numbers 6, 8, 10, 12 and 14. Their main purpose is to enhance the appearance of an assembly or to seat against soft materials such as wood, leather, cloth, etc. They also eliminate counterboring operations.

Other standard aluminum fasteners include wing nuts for bolt sizes No. 10 through ⅜-inch; flattened head thumb screws in the same size range; knurled thumb screws with 8-32 thread; wing screws in sizes No. 10 through ⅜-inch; studs and stud bolts; set screws (slotted or square head); and items such as threaded nails, drive screws, and others.

Tension; Shear; Torque

As noted earlier, nearly all standard aluminum screws and bolts are produced in alloy 2024-T4. It has the following minimum properties: Tensile strength, 62,000 psi; yield strength 40,000 psi; shear strength, 37,000 psi. These values are important in determining a fastener's ability to successfully resist service loads of the joint.

You can determine a bolt's breaking point by multiplying the alloy's minimum strength by the bolt's net area at the root of the thread. (The net thread root areas for bolt diameters of ¼ through 1-inch, are given in Table 1. Also shown are the diameter at thread root and the gross area of shank.)

To figure a bolt's shear strength multiply its gross shear area at the shank by the shear strength of the material. (In a properly selected and installed screw or bolt, shear loads are carried by the unthreaded portion of the shank.)

The shear strength of a fastener, be it a screw, bolt or rivet, may be reduced somewhat if the joint includes a member that is appreciably thinner than fastener diameter. When shear strength is important, this factor should be taken into consideration.

The clamping force produced in tightening a bolt may also influence the slip behavior of a joint. A high clamping load induces frictional drag between joined members, and this drag may be sufficient to counteract shear forces that would otherwise be imposed on the fasteners.

However, the ultimate shear strength of a bolted joint is controlled by the shear strength of the fastener plus the bearing strength of the material joined. Any reduction of slippage resulting from the clamping load may be con

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sidered an added safety factor. Tests at Alcoa Research Laboratories have demonstrated that pre-tensioning of bolted joints actually develops the shear strength of the bolt material.

Proper pre-tensioning of the bolt also counteracts fatigue loads. The bolt won't fail in fatigue — in fact, is not subjected to stress variation — as long as the maximum service load is below the pre-imposed clamping force in the bolt. (This assumes that the joint is rigid. The presence of a gasket or other soft material between the joined members can prevent tightening of the bolt to above working loads, so a higher safety factor is recommended in such cases.)

Strength in tension is another matter. It is here that clamping force plays its vital role. If a bolt is not tightened to its maximum permissible clamping load, the performance capability of the fastener is not fully utilized. The trick is to reach this maximum permissible load without going beyond it and breaking the bolt.

With steel fasteners, up to 90% of the torque needed to produce a given clamping force is expended in overcoming friction on the threads. But this may not be the case with an aluminum bolt, whose smoother finish reduces friction.

This is why a given torque value will produce a substantially higher clamping load in an aluminum bolt than in a steel bolt — under equal conditions of lubrication, etc. (Table 2 gives suggested maximum torque values for 2024-T4 alloy fasteners. Use these values only as a guide.)

To Determine Torque . . .

There's another crucial difference between aluminum and steel fasteners. Although the ultimate tensile strength of alloy 2024-T4 approaches that of mild steel, its stress-strain characteristics are different. The thing to remember when tightening an aluminum fastener is that once the yield strength is reached, the aluminum fastener will not tolerate as much additional rotation as will the steel fastener.

Herein lies the danger of overtorquing an aluminum fastener to the breaking point. Obviously, the amount of torque needed to produce a given clamping load is governed by the size of the fastener, smoothness of the threads, hardness of the material, and lubrication. If the last three variables can be controlled within reasonable limits, an approximate torque value can be determined for production purposes.

One approach is to tighten several of the fasteners to the breaking point with a torque wrench, and record the amount of torque needed to break each fastener. Then take 80% of the minimum torque obtained and use it in production. (Needless to say, the test should be conducted under conditions simulating those to be encountered on the job.) This will provide a clamping force approaching the yield point of the fastener.

If the joint must sustain fluctuating (fatigue) loads, it's a good idea to boost the tightening torque to about 5% above the maximum tensile load to be imposed on the fastener in service. This will render a rigid connection immune to stress variations, assuming that the right fastener has been selected and the joint has been designed properly.

With the torque value determined, you're in business. If a manual torque wrench is used in production, you simply tighten the fasteners to the proper value as indicated on the dial of the wrench. Some pneumatic driving tools have provision for regulating air pressure so that the tool will stall when pre-determined torque is reached. Others have a shut-off device that cuts off the air when desired torque is reached.

If on-site conditions forbid the use of power tools or torque wrenches, you can use the familiar turn-of-screw method of reaching optimum clamping force. The bolt (or nut) is snugged down by hand, after which a predetermined number of turns with an ordinary wrench is used to stress the fastener to its optimum clamping force. Of course, the number of turns is determined in advance with a torque wrench under conditions simulating those to be encountered in production.

Aside from mechanical properties, the factors that govern fastener selection are tied to considerations of design, cost, quantity, etc., peculiar to each individual case. It is impractical to draw up a list of specific recommendations, but a general strategy may be summarized as follows:

1. Determine the load to be borne by each fastener, and ascertain whether the load will be applied in shear, tension, or both. If load distribution will be non-uniform, use as your guide the maximum stress to be sustained by any one fastener.

2. Choose a safety factor making sure that you allow for complications such as joint flexibility, which would impose bending loads on the fastener. In such cases a higher safety factor is needed.

3. Determine clearances for tooling. (If bolts are to be hand wrenched, for example, provide clearances for at least a 60 degree arc travel of the wrench. This could influence the number, hence the size, of bolts to be used.)

4. Assuming that you'll use aluminum fasteners, select the type and size that will successfully sustain the working loads in service. (To determine the tensile and shear strengths of various aluminum fasteners, use the formulas given earlier.)

5. Determine the torque value needed to produce the desired clamping force in the case of bolted connections or the torque needed to firmly seat other types such as sheet metal screws.

Holes: How to Make Them

An important factor in screw fastening aluminum is the production of holes for bolts, screws, studs, etc. The conventional means — punching, drilling and reaming — are used, the choice depending upon service conditions to be encountered, speed of production, thickness of the material to be joined, and type of fastener to be used. Secondary operations may include counterboring, dimpling or tapping.

For bolts and screws in lightly or moderately stressed applications, a 3% clearance between fastener and hole will suffice. For highly stressed uses the clearance should be smaller. (Self-tapping screws, on the other hand, go into holes that are smaller than the major diameter of the thread. This is discussed later under "High Speed Fasteners.")

Punching or drilling of holes is adequate for most lightly stressed joints. Reaming should be used if the assembly must withstand vibratory stresses.

Punching of holes in light gauge

TABLE 2

Suggested Maximum Torque Values For 2024-T4 Fasteners

Fastener Size & Thread	Torque (lb-inch)
2-56	1.4
3-48	2.1
4-40	2.9
5-40	4.2
6-32	5.3
8-32	10.8
10-24	13.8
1/4"-20	45.6
5/16"-18	80
3/8"-16	143
7/16"-14	228
1/2"-13	313
9/16"-12	413
5/8"-11	715
3/4"-10	980
7/8"-9	1495
1"-8	2205

To be used only as a guide for noncritical torquing. These values should develop bolt tension to slightly less than yield point.

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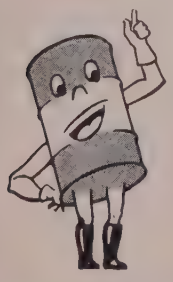

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aluminum sheet and shapes is usually done on a conventional mechanical press fitted with a movable punch and stationary die. For proper clearance between these tools, the die diameter should be about 5% greater than punch diameter. It makes for a smoothly punched hole, prevents interference that could damage the tools, and reduces the amount of press power needed. (But if it's too much over 5%, the blanked slugs might stick to the punch.)

Cutting edges of the punch and die should be kept sharp. It's a good idea to provide a die relief of .75 degree or more for fast disposal of the punchings.

Gang punching of holes is an oft-used means of speeding production. In this case the punches should be stepped the amount of each step being slightl less than the thickness of the sheet. I the step is greater, an uneven actio results.

It is not unusual to pierce th holes for fasteners in the same press op eration that blanks out larger open ings for access doors, etc., but the tool ing can be tricky. The punches fo large openings should be longer tha those that pierce fastener holes. Lubr cation of punches with light machin oil will ease the piercing operation.

Table 3: Recommended Tap Drills for Various Sizes of Coarse Threads in Aluminum Alloys

Also, maximum depth of tapped hole; minimum clearance at bottom of hole

(dimensions in inches)

Thread Size (Threads per inch)	Stock Drills Nominal size	Decimal diameter	Per cent Depth of basic thread	Recommended maximum depth of tapped hole (usable thread)	Recommended minimum clearance at bottom of tapped blind hole
2-56 NC	No. 50	.0700	69	11/64	5/32
	No. 49	.0730	56		
3-48 NC	No. 46	.0810	67	13/64	5/32
	2.10 mm	.0827	60		
4-40 NC	No. 43	.0890	71	7/32	5/32
	2.30 mm	.0906	66		
	3/32 in.	.0937	56		
5-40 NC	No. 38	.1015	72	3/8	5/32
	2.60 mm	.1024	70		
	No. 37	.1040	65		
6-32 NC	7/64 in.	.1094	70	13/32	5/32
	No. 33	.1130	62		
8-32 NC	No. 29	.1360	69	1/2	5/32
	3.50 mm	.1378	65		
	No. 28	.1405	58		
10-24 NC	No. 24	.1520	70	9/16	13/64
	No 23	.1540	66		
	No. 22	.1570	61		
	No. 21	.1590	57		
12-24 NC	No. 16	.1770	72	21/32	13/64
	No.15	.1800	67		
	No. 14	.1820	63		
1/4-20 NC	13/64 in.	.2031	72	3/4	1/4
	No. 5	.2055	67		
5/16-18 NC	G	.2610	71	15/16	9/32
	17/64 in.	.2656	65		
3/8-16 NC	O	.3160	73	1-1/8	5/16
	P	.3230	64		
7/16-14 NC	U	.3680	75	1-5/16	23/64
	3/8 in.	.3750	67		
1/2-13 NC	7/16 in.	.4375	62	1-1/2	3/8

NOTES:

1. **Stock drills do not all fall between the maximum and minimum minor diameter. However, these values are frequently disregarded in practice, especially when tapping deep holes.**
2. **Maximum recommended depth of tapped holes is given opposite largest drill for each thread size since greatest depth is obtained most economically by using largest possible drill. This value varies considerably with the material being tapped; figures given are for more machinable alloys. Holes deeper than recommended values may be tapped, but usually at increased cost. Reducing depth of thread form by use of a larger tap drill will minimize additional cost.**
3. **Maximum depth of tapped hole for threads over ½-inch dia. is usually governed by factors other than strength of the tap and ability to clear out chips, which are limitations for smaller sizes. It is therefore impossible to list maximum depths for the larger sizes.**
4. **Recommended minimum clearance at bottom of blind tapped holes are for most economical manufacture. Threads may be tapped closer to bottom at increased cost in most cases.**
5. **From data by Aluminum Company of America.**

Drilling; Reaming; Boring

Drilling will produce smoother hole for fasteners, particularly in thicke sheet, extrusions and castings. Som machinists consider aluminum a "gum my" metal — probably because the use the same tools and techniques use on steel. Actually, it's an easily ma chined material.

When drilling fastener holes in ligh gauge sheet or shapes, the conventiona 28° helix twist drill with 118° poin angle will do the job. If gauges ar really on the light side, trim back th point somewhat so that the full cuttin edge will engage the work before th point pierces it. You may be better o punching holes in such light stock however.

If your drill press or portable dril delivers high spindle speeds, so muc the better. Small holes should be drille at the highest rpm rate available o most equipment. Aim for a cutting rat of at least 600 fpm with drills made o high-speed tool steel; up to 2000 fpr with carbide tipped drills.

When drilling holes in castings, forg ings, thick plate and extrusions, bette results are obtained with drills havin a 40° helix angle and a 130° poin angle. The flutes should be longer tha usual and polished smooth so that chip will slide out easily.

Thin out the cutting points by groov ing them slightly, and boost lip clear ance to about 20° for soft alloys an heavy feeds (this will curb tool wear).

When drilling deep holes (over si times drill diameter), chip removal wil probably be sluggish; it's advisable t back the drill out a couple of time and flush out the chips.

Lubrication may not be needed fo drilling thin stuff, but it's definitel advisable for deep drilling. Use solubl oil, kerosene, or proprietary compound Don't spare the lubricant-coolant, les the work and the tool become over heated due to the high coefficient o friction between steel and aluminum Excessive frictional heat causes hig tool wear and oversized holes.

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(*Continued on page 74*)

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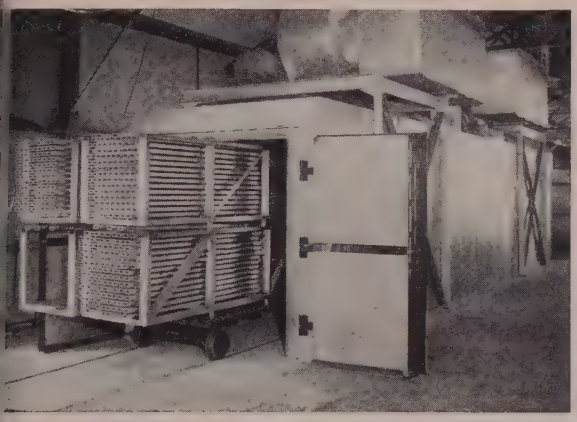

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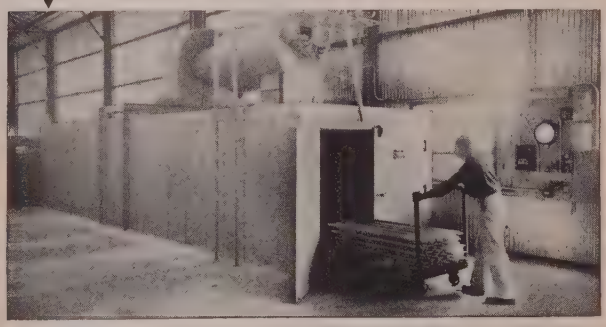

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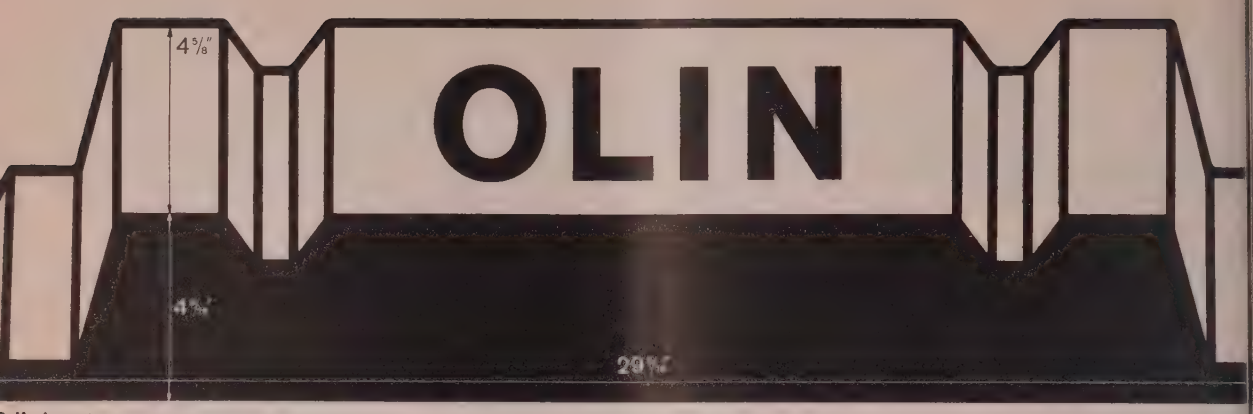

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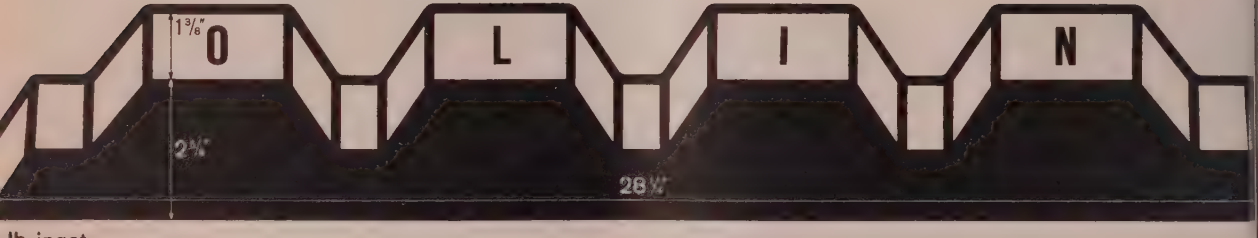

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machinability by using high feed rates — on the order of .004 to .012-inch per revolution with drills up to 3/8-inch diameter, and up to .020-inch for larger drills.

Special practices are advised for the high-silicon casting alloys used in automotive engine parts. Smaller point angles — about 90° — and lower feed rates are necessary. Better results are obtained with carbide tipped drills. The drill will hit an occasional hard chunk of primary silicon in these castings, so it's a good idea to check sharpness of the cutting edges periodically.

If tools are breaking, make sure that the drill is lined up accurately and chucked securely, and that the workpiece is stationary. If breakage continues, ease up on the feed rate. And if this doesn't work, the trouble probably stems from insufficient chip clearance. Narrower lands and margins may be needed to open up chip space in the flutes.

Reaming; Counterboring

Reaming is recommended for fastener holes in assemblies subjected to high vibrational loads. On aluminum, use spiral reamers with the spiral opposite to the rotational direction. Honed cutting edges give clean cuts, and large flutes ease the removal of chips. Teeth should be of the solid type, evenly spaced, with a rake angle of 5° to 10° and a secondary clearance angle of 15° to 20°. Width of lands should be .020 - .060-inch.

Be sure to start with a sufficiently undersized drilled hole in order to give the reamer enough bite — say, .006 to .016-inch. This will avoid scraping and overheating. Generous use of lubricant-coolant will help suppress overheating, which causes distortion and undersized holes.

The proper tool, run at a cutting speed of 400 fpm and a feed rate of about .010-inch per revolution, should produce a well reamed hole. If trouble is encountered, check the preliminary drilling operation. A dull drill can work-harden the hole, making the job tougher for the reamer.

Holes for flush fasteners may be counterbored or pre-dimpled, depending upon the thickness of the stock. In the former case, uniform results are obtained with an adjustable-stop counterbore. The adjustment is set to place the head of the driven fastener neither above nor much below the surface of the work.

Bores with two to four cutting edges may be used, and better alignment is achieved with spiral fluted tools. Be sure to select the proper counterbore for the type of fastener head used. The 80-82° head is standard, but some fasteners have a 100° angle head.

Pre-dimpling of light gauge stock for countersunk screws is usually performed on a press fitted with a special punch and a dimpling die. If the part is not too large, several die sets can be installed for gang-dimpling. If the work is too big or ungainly to be handled on the press, a squeeze riveter fitted with suitable dies can often be used.

The dimpling die usually has a slightly larger angle than the punch. For a standard 80-82° head screw, for example, the die would have a 90° angle while the punch would conform to the screw head angle. Dimpling often increases the shear strength of sheet while counterboring may result in lower shear strength. If the stock is one of the strong alloys in a hard temper, inspect the dimpled area for cracks.

Table 4: Hole Sizes* for 2024-T4 Sheet Metal Screws

(in all tempers of alloys 1100, 3003, 5052 and in 6061-T4)

dimensions in inches

Screw size	Metal thickness	Pierced hole	Drilled or clean punched hole	Drill number
TYPE A — GIMLET POINT				
4	0.016	0.088	0.073	49
	0.020	0.088	0.073	49
	0.025	0.088	0.073	49
	0.032	0.098	0.076	48
6	0.016	0.098	0.082	45
	0.020	0.098	0.082	45
	0.025	0.098	0.082	45
	0.032	0.098	0.089	43
7	0.016	0.111	0.093	42
	0.020	0.111	0.093	42
	0.025	0.111	0.093	42
	0.032	0.111	0.093	40
	0.040	0.120†	0.106	36
8	0.016	0.120	0.098	40
	0.020	0.120	0.098	40
	0.025	0.120	0.098	40
	0.032	0.120	0.104	37
	0.040	0.136†	0.110	35
10	0.016	0.120	0.101	38
	0.020	0.120	0.101	38
	0.025	0.120	0.101	38
	0.032	0.136	0.106	36
	0.040	0.136†	0.113	33
12	0.025	0.157	0.128	30
	0.032	0.157	0.136	29
	0.040	0.185†	0.144	27
14	0.032	0.185	0.152	24
	0.040	0.185†	0.166	19
TYPE B — BLUNT POINT				
4	0.025	0.086	.....	.....
	0.032	0.086	0.086	44
	0.040	0.086	0.086	44
	0.051	0.086	0.086	44
	0.064	.....	0.089	43
	0.081	.....	0.089	43
	0.102	.....	0.093	42
6	0.025	0.111	.....	.....
	0.032	0.111	0.104	37
	0.040	0.111	0.104	37
	0.051	0.111	0.104	37
	0.064	.....	0.106	36
	0.081	.....	0.110	35
	0.102	.....	0.110	35
7	0.025	0.120	.....	.....
	0.032	0.120	0.113	33
	0.040	0.120	0.113	33
	0.051	0.120	0.116	32
	0.064	.....	0.120	31
	0.081	.....	0.128	30
	0.102	.....	0.136	29
	0.125	.....	0.136	29
8	0.025	0.136	.....	.....
	0.032	0.136	0.116	32
	0.040	0.136	0.120	31
	0.051	0.136	0.128	30
	0.064	.....	0.136	29
	0.081	.....	0.140	28
	0.102	.....	0.147	26
	0.125	.....	0.147	26
	0.156	.....	0.149	25
	0.188	.....	0.152	24
10	0.025	0.157	.....	.....
	0.032	0.157	.....	.....
	0.040	0.157	0.144	27
	0.051	0.157	0.144	27
	0.064	.....	0.144	27
	0.081	.....	0.147	26
	0.102	.....	0.147	26
	0.125	.....	0.154	23
	0.156	.....	0.159	21
	0.188	.....	0.166	19
12	0.051	.....	0.161	20
	0.064	.....	0.166	19
	0.081	.....	0.173	17
	0.102	.....	0.180	15
	0.125	.....	0.182	14
	0.156	.....	0.189	12
	0.188	.....	0.189	12
	0.250	.....	0.196	9
14	0.064	.....	0.199	8
	0.081	.....	0.201	7
	0.102	.....	0.204	6
	0.125	.....	0.209	4
	0.156	.....	0.213	3
	0.188	.....	0.213	3
	0.250	.....	0.228	1

*Recommended. Slight deviations may be preferred in some applications.

†For Type A screws, pierced holes not recommended for thicknesses above .032" in alloys 5052 and 6061.

Tapping Internal Threads

The tapping of internal threads in aluminum castings, forgings, plate and extruded shapes calls for some modification of conventional procedure. Spiral fluted taps are preferred over the straight-flute type, particularly when threading soft alloys. Use right-hand flute for right-hand thread, and vice versa.

Generous proportioning of flutes will ease disposal of chips, thus forestalling thread damage and tap breakage. Polishing of flutes will also aid in this respect.

Tap threads should be undercut slightly to provide a rake angle of 10° to 20° on the leading edge and 10° to 15° on the trailing edge. The rake on the trailing edge prevents the tap from binding when it is backed out.

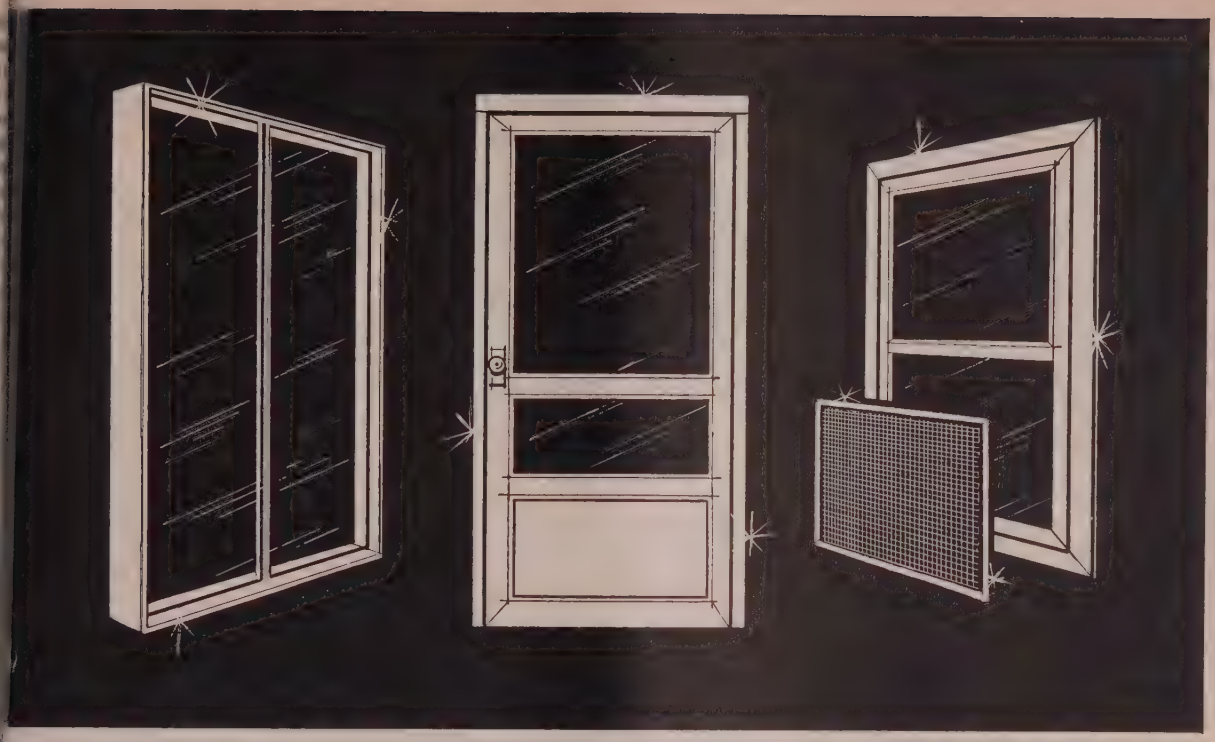
When threading through-holes or blind holes with ample bottom clearance you can use a spiral pointed tap. Since most of the cutting is performed by the leading threads of this tap, the chips are pushed ahead of the tool.

Take care to select the proper size of tap drill — the tool that produces the minor diameter or crest of tapped threads. Use of too small a drill will result in an undersized thread that will tend to seize when the fastener is installed.

Recommended stock tap drills for various thread sizes are given in Table 3, along with the percentage depth of basic thread, recommended maximum depth of tapped hole, and recommended minimum clearance at the bottom of a tapped hole.

In a tapped thread, the difference between the diameter at the root and the diameter at the crest is known as the depth of thread. And the relationship between this and the full depth of the theoretical basic thread form is the percentage depth of thread.

It's good practice to avoid using a



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drill that will give more than 75% depth of thread. Anything greater will tend to cause seizing of the fastener in the threaded hole. In any event, a drop of light machine oil will expedite insertion of the fastener.

Inserts Beef Up Threads

Various types of inserts are often used to bolster tapped threads in aluminum parts—particularly if fasteners must be removed and replaced frequently. Other types tap their own holes. Still others are molded into the part to be fastened, though these are more often used in plastics.

Although inserts are not standard fasteners in the ordinary sense, some of the commonly used types should be considered in connection with tapped holes. Others will be discussed in the "Special Fasteners" section of this series of reports (April issue).

The familiar Heli-Coil insert (Heli-Coil Corp., Danbury, Conn.) is a precision formed coil of 18-8 stainless steel that provides highly wear resistant threads in standard 60° form.

The smooth finish and high hardness of the threads make this insert ideal for applications in which screws or bolts must be removed and replaced. It also boosts the strength of threaded assemblies, often permitting reduction in number or size of fasteners.

The Heli-Coil is made slightly oversize for a given hole diameter so that it locks tightly in place. The driving tang located at the bottom of the insert may be broken off after installation. It can be installed with simple hand tools or with special power tools that speed up the operation.

Sizes range from No. 4-40 to 1½-6 in UNC series threads, and 6-40 through 1½-12 in the fine series. Lengths are from 1 to 3 times the diameter, and fits are Class 2, 2B, or 3B.

Variations of the Heli-Coil include a Screw-Lock model that firmly locks the screw or bolt in place; and the Heli-Coil PIP insert that is pushed rather than threaded into place, and can be installed by high-speed hopper fed machines. The latter type is often used in die castings.

Another insert that is threaded into a tapped hole is the Keensert (Newton Insert Co., Los Angeles 3), an internally and externally threaded device that is locked in place by two dovetailed keys which are driven flush after the insert has been installed.

The Keensert is said to impart high pull-out resistance due to the modified external threads. Internal thread sizes are from No. 4 through 1-inch diameter in both UNC and UNF series. Materials include Type 303 stainless steel, cadmium plated carbon or alloy steel, and 7075-T6 aluminum alloy.

The Tap-Lok insert (Groov-Pin Corp., Ridgefield, N. J.) offers a self-tapping advantage that eliminates the cost of tapping holes before installation. The tapping action begins when the tapered pilot section is driven into a drilled hole. The full diameter threads follow, forcing their way into the parent metal. Resulting displacement of material develops a formidable locking action as the insert is completely seated.

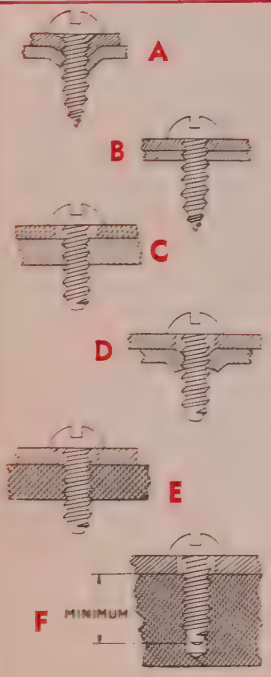

FIG. 2: DESIGN TIPS FOR SHEET METAL SCREWS

When joining two thin sheets of aluminum together holes can be pierced in both pieces at same time. Resultant conical nesting (as in A) boosts strength of the joint by increasing thread engagement. Conventional approach is to drill or clean punch holes in both pieces (B).

When fastening thin section to thicker member, provide slightly oversized clearance hole (as in C) to prevent threads from wedging between members. Clearance hole is also advised when bottom member has extruded hole (as in D) for additional thread engagement.

When fastening sheet to soft or flaky material (as in E) minimum penetration required governs minimum stock thickness through which screws are driven. If thread forming screws are used in castings, minimum penetration applies to tapped portion only (as in F) not to untapped portion just under head. In blind hole provide ample bottom clearance for screw.

Courtesy of Central Screw Co., Chicago

Internal threads of Tap-Lok are Cla 2B in sizes No. 2 through ¾-inch. Reg lar and short lengths are produced f varying applications. Simple installatio tools engage the slotted bottom end insert.

Variations include the H (hole) seri designed primarily for high-strengt hard-to-tap materials. The truncat root external thread and three hol cutting edges make it a stronger inse Produced in steel and stainless steel military and other specs calling f Class 3B fit, the H series comes in siz No. 4 to ¾-inch, in regular, mediu and short lengths.

The N (Nylok) series is a standa Tap-Lok with a nylon pellet perm nently embedded in the internal thread When a fastener is inserted the pell is compressed, producing a tight, vibr tion resistant joint. Sizes are No. through ½-inch in medium and regul lengths.

High Speed Fasteners

Self-tapping screws, as the name im plies, need no tapped threads. The are driven into pierced, drilled or s called extruded holes—forming or cu ting their own mating threads as the go. The popularity of these fastene is due primarily to the elimination tapping operations, plus the fact th they can be installed from one side the work without the aid of nuts other auxiliary fasteners.

There are several types of tappin screws, but the ones most commonl used in aluminum products are th thread forming varieties, "A" and "B known as sheet metal screws. They d not actually tap the mating thread the action is one of forming the threa by displacement of material in the par joined.

The resulting zero clearance betwee mating threads produces a fit that tight enough for most applications wit out lock washers or other locking fa teners. Another attribute of the shee metal screw is its high driving speed making it an ideal fastener for rapi repetitive assembly operations emplo ing pneumatic or electric tools wit automatic releasing clutches (detaile later).

Type A and Type B sheet meta screws have 60° V-shaped threads wit sharp crests and wide roots. The forme has a gimlet point, and is usuall specified for fastening sheet gauges fro .015 to .050-inch. Type B has a blun point, and is generally used for heavie gauges (.050-.200-inch) and in extru sions and castings. Both can also b used in wood, composition board, an some plastics.

Aluminum sheet metal screws ar easily driven into all of the non-hea

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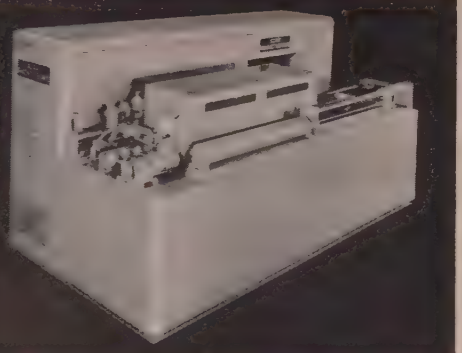

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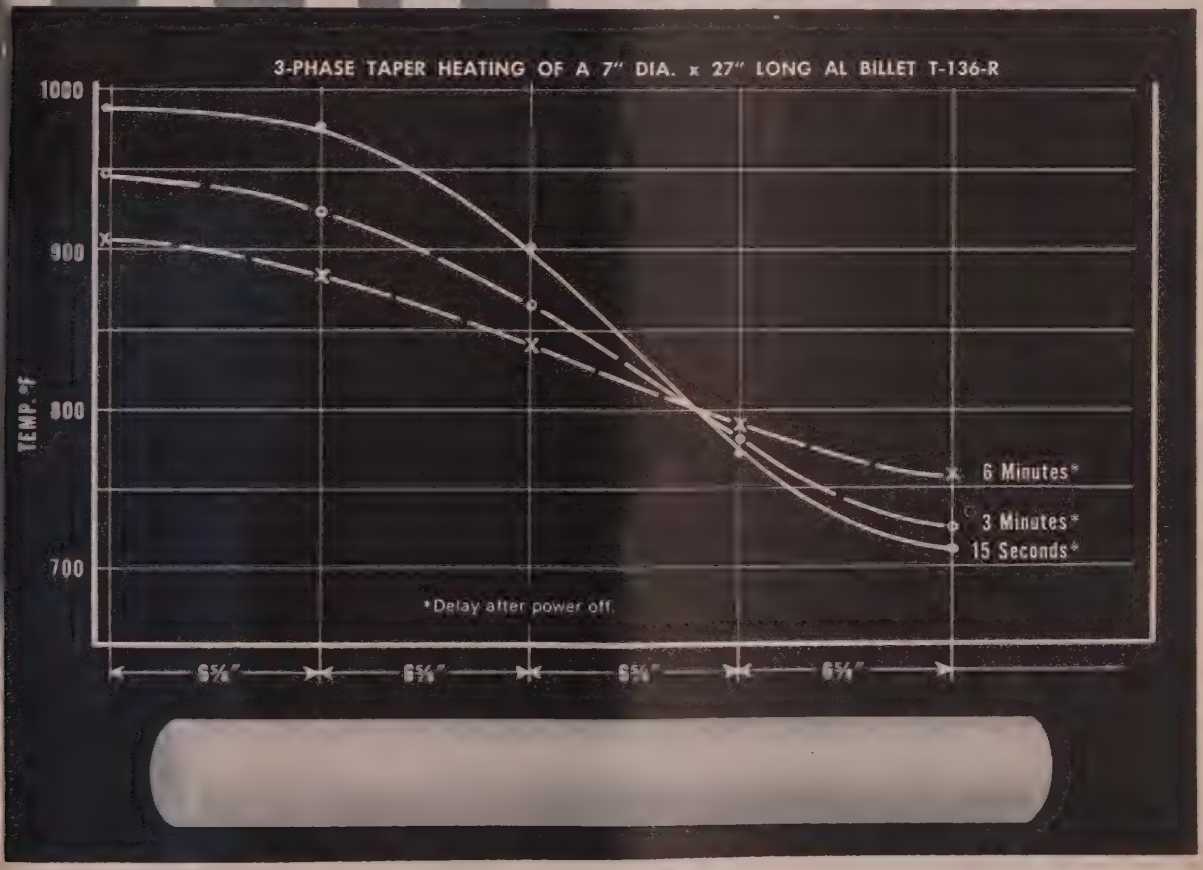


treatable aluminum alloys (all tempers), as well as in all tempers of heat treatable 6063 extrusion alloy. They can also be applied in 6061 alloy in the —T4 temper, and in many of the aluminum casting alloys.

The harder wrought alloys and the high silicon casting alloys are too hard or abrasive for aluminum sheet metal screws. When fastening these materials you're better off with aluminum machine screws or bolts, or tapping screws made of stainless steel or plated steel. (Lighter gauges of 6061-T6 will often take aluminum sheet metal screws, however.)

Although simplicity of application is one of the sheet metal screw's shining virtues, the accurate matching of screw size to lead hole size can be tricky. You have to consider not only the strength requirements of the joint, but also the drivability of the screw.

The ratio of driving torque to torque strength of the screw must be low enough to forestall breaking of the screw or stripping of its thread, yet high enough to firmly seat the fastener. This is where hole size enters the picture. In Table 4 you will find recommended hole sizes correlated with screw size and metal thickness. Drill number also is shown.

Test for Torque

To be on the safe side, run some driving tests—particularly for a high volume production run employing powered drivers. Your test piece is a sample of the material to be fastened, and the holes are produced by the method to be used in production. One hole is the recommended size; another is one size smaller; the third, is a size larger.

Using the type of tool to be employed in production, run several tests to determine which hole size will permit the best ratio of driving torque to breaking torque. It will usually be the recommended size, but a hard alloy may require a bigger hole while a softer alloy will produce stronger clamping force on the smaller hole. In most applications, shoot for a driving torque one-third as high as breaking torque. This will leave an ample safety factor.

If you can't get a comfortable spread between driving torque and breaking torque, all is not lost. Try a larger screw. Torque strength is proportional to the square of the diameter, while required driving torque rises at a much smaller rate as screw size is increased. Thus, the problem may well be licked by using a screw that is only one size larger.

Lead holes can be produced by the methods described earlier for bolts and machine screws (except that you won't bother to ream holes for sheet metal screws). For applications involving light gauges, some authorities recommend "extruded" holes, with the mating parts nested to provide a larger area of engagement between fastener and part (see Fig. 2).

When using Type B screws to fasten light gauge sheet metal to heavier sections such as extrusions or castings, it might be wise to provide a slightly oversized clearance hole in the thinner member. This will help prevent wedging of threads between the parts. It will also reduce the amount of driving torque needed to firmly seat the fastener.

When joining very thin sheets with Type A screws, take special care not to over-drive the fasteners. If the material is fairly hard it may strip the partial thread just under the head of the screw, resulting in a loose assembly.

If Type B screws tend to chip the material when driven into castings, a slight countersink at the lead hole may lick the problem by making it easier for the blunt point of the screw to start the threading operation. In die castings don't overlook the cost-cutting possibility of coring the lead holes, thus eliminating one more operation.

Sheet metal screws with Phillips recessed heads are better looking than the prosaic slotted head. What's more they're easier to drive at high production rates. Three of the four standardized Phillips drivers will handle all needs. Use No. 1 driver for screw sizes up to No. 4; No. 2 driver for screw sizes No. 6 to 10; and No. 3 driver for screw sizes No. 12 to 14.

Use Powered Drivers

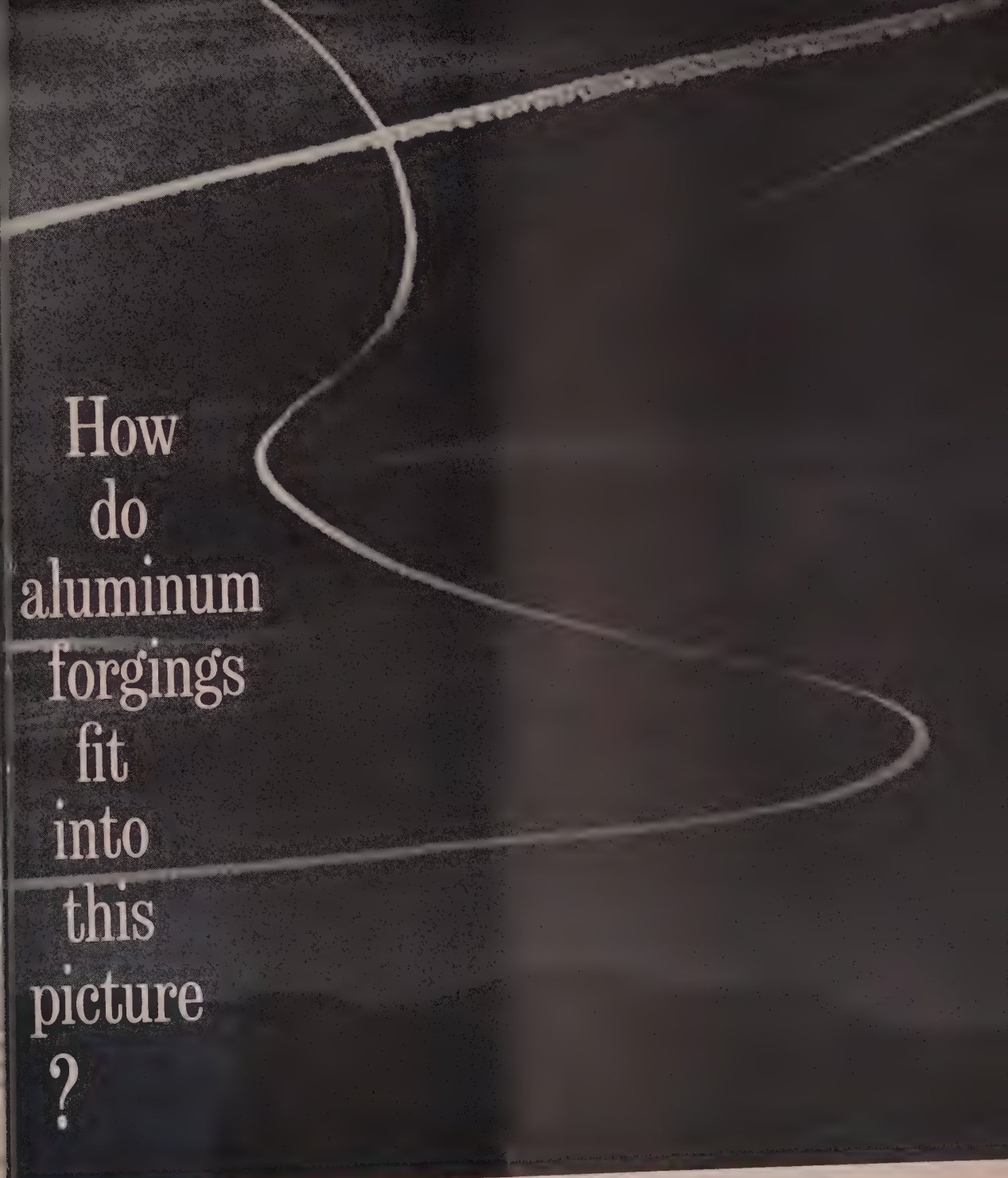
Somewhere, a young working housewife has looked on with amusement or sympathy while her mechanically minded mate took a curse-filled half hour to install a drawer handle with four wood screws and his trusty hand screwdriver. A few hours earlier, on the assembly line of X-Y-Z Trailer Co., she and her powered screwdriver deftly zipped sheet metal screws firmly into place at rates of 20 or more per minute.

Today, powered screwdrivers and nut runners are nearly as commonplace in

(Continued on page 81)

CASE HISTORY: Electric Screwdrivers Save Door Firm 9000 Man Hours a Year

Total man hours saved reached 9000 per year after Capitol Products Corp., Mechanicsburg, Pa., installed 20 portable electric screwdrivers on its storm door production line. The firm had already made more than 1 million doors using conventional manual screwdriving techniques, but felt production was too slow and costly. The firm decided to install powered screwdrivers, supplied by Thor Power Tool Co., Aurora, Ill.—and manhour savings began to mount immediately. But Capitol president Gene Gurkoff says manhour savings aren't the only advantages of the tools. He claims door quality has been improved, operator fatigue reduced, and the number of false starts and amount of waste material also substantially lowered.



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the small job lot manufacturing plant as on the mass production assembly line. So well known are the general advantages of these production tools that we will dwell rather on the features of specific types and models.

The principal traits that distinguish one driver from another include size and capacity; type of power (compressed air or electric motor); type of clutch; and style of handle. Other features include reversibility (for removing screws) and adaptability for either driving screws or running nuts. There are also impact wrenches, used mainly for driving machine bolts.

Size and capacity of tool for a given job depend primarily on type and size of fastener to be handled. The specification sheets of most tool manufacturers indicate the type and size of fastener each model can handle.

There are three main types of clutch mechanisms—positive, slip, and self-releasing. In most cases the positive clutch is an idling device that permits the motor to keep running while the bit remains stationary so that it can engage the fastener head. Forward pressure on the tool engages the clutch so that rotational force is transmitted from the spindle to the driving bit.

As long as the clutch is engaged, the tool continues to drive the fastener. There is no torque control; the operator must judge when the fastener is properly seated, then release the pressure.

To Control Torque . . .

Slip clutches cost a little more, but workers don't need as much skill. The maximum torque needed to set a screw is pre-set. When this torque rating is reached and the tool begins to slip, the operator merely disengages it and moves on to the next fastener.

The self-releasing driver is the most accurate—and most expensive—tool, but it requires the least skill. Fitted with an external torque control that is adjusted to the exact torque needed, this unit automatically disengages the fastener and shuts off the motor once the predetermined torque is reached.

No judgment is required of the operator. Broken screws and stripped threads are all but impossible—if the torque control has been set correctly. This is the best type of driver for aluminum fasteners.

To get an idea of the extra cost of the pre-set self-releasing screwdriver, let's compare three units offered by Skil Corp., Aurora, Ill. Model 139 pistol grip unit with positive clutch can handle machine screws and nuts to No. 10 and wood and tapping screws to No. 12. The tool has a speed of 900 rpm (no load), and sells for $42.50.

Model 132, with a slip clutch, will drive machine screws and nuts up to ¼ inch, and wood and self-tapping screws up to No. 12. It has a 750 rpm speed and costs $96.

Model 235, with self-releasing clutch has the same specs; is tagged at $115. The adjustable torque range is 0 to 100 inch pounds. The unit can be had with optional speeds of 500, 1000 or 1500 rpm. Motors are Universal, A. C. and D. C. up to 60 cycles.

This same driver can be had with a reversing switch (Model 272) for disassembly use. The reversing tools have extra torque for speedier removal of screws, and cost $10 more.

Both models come with a bit for driving round or flat slotted head wood screws, or round or flat (oval, fillister and binding) slotted head machine screws. Additional bits can be purchased for driving hex head and Phillips head screws. Bit prices range from about 85 cents to $3.25.

Air powered drivers also have preset self-releasing torque control devices. Cleco Air Tools, Houston, Tex., offers reversible or non-reversible tools with either lever or pistol grips. The Clecomatic No. 10 costs $210 ($235 for reversible units).

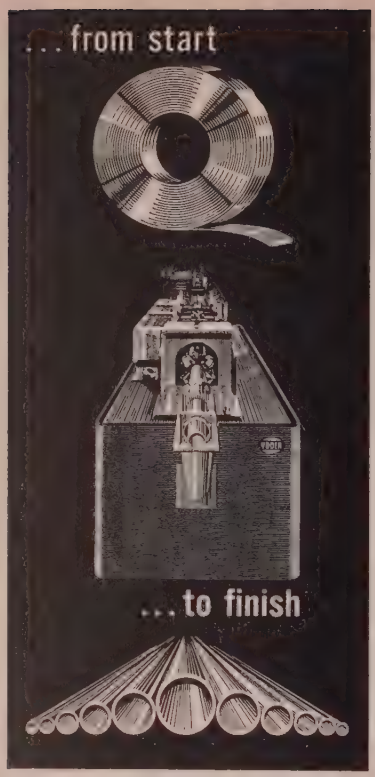
Cleco asserts that the air tool, with its fewer number of parts, costs less to maintain than electric tools; lasts longer because it is not as intricate; and is safe and simple to operate because there are no electrical connections.

The Clecomatic No. 10 tool is sold with optional speeds of 500, 1000, 1500 and 2900 rpm. Torque setting ranges from 5 to 85 inch pounds at 500 rpm to 5 to 30 at 2900 rpm (soft pull up); and 5 to 90 at 500 rpm to 5 to 40 (free running slam). Reversible tools have slightly lower torque ranges. The air driver can apply screws with any shaped head, and in sizes up to ¼-inch.

Choice of handle style may be a matter of personal preference — or it may be dictated by the type of work to be fastened. The pistol grip is usually best for driving fasteners into vertical work surfaces, or for jobs in which the tool is taken to the work.

The straight handle (or center drive) tool is most often found in assembly lines in which the work is conveyed past seated operators. These tools are usually suspended from above.

Angled driving heads are often needed when there is insufficient clearance for either straight or pistol grip tools. An example is the air powered, handfed tool made by Albertson and Co., Sioux City, Ia. Its driving head is fitted at a 90° angle to the lever handle. This tool drives at a speed of 800 rpm (no load), reverses at 600 rpm. It has a positive clutch. Hex head screws up to ¼-inch can be driven with the ac-



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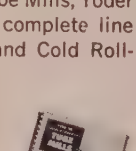

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companying bit, but bits for other types of screws, or for nut running, can be used.

Driving units that can be reversed are needed if screws or nuts must be removed. Repair or test work are specific instances when a reversing tool is needed.

Nut set attachments offered by Thor Power Tool Co., Aurora, Ill., come in three styles. The straight nut setter has a quick change ball lock and comes with one socket wrench shank and one socket. Other attachments are the 90° single end nut setter and 90° double end nut setter.

Bits: 2-Piece; 1-Piece

Many companies specialize in making driving and nut running attachments for tools manufactured by other firms. Apex Machine and Tool Co., Dayton, Ohio, offers two types of driving attachments: two piece and one piece.

Two piece tools are comprised of a bit holder and an insert bit. Insert bits come in various sizes to drive Phillips, Frearson, slotted, clutch, socket and hex head screws. Some 20 different shanks can be had to fit the tools of 22 different companies. In one piece tools, the bit is integral with the holder shank. These are available for driving all but hex head screws.

Apex nut running sockets can be obtained in tapered, straight or shoulder shapes; in short, standard, long and extra long ends; and with standard, thin or extra thin walls.

Fast lead sockets replace the double hex type used for multiple unit power tools, and for production operations. A special broached opening makes it possible to run a series of nuts without having to start and stop the tool for each nut.

The power screwdriver can be of many shapes and sizes. Example: The Shakeproof 400 (Shakeproof Power Tools Division, Elgin, Ill.) which is a pedestal unit almost 6½ feet tall. It sells for $1350.

This electric, hopper fed unit can drive screws of any head style, and ranging in size from No. 2 to ¼ inch. Its self-releasing clutch is said to give perfect torque control, adjustable from 0 to 90 inch pounds.

Screws flow from the hopper, point down, along tracks. When the foot switch is tripped, a screw falls into the catcher which positions the fastener over the hole. The driving bit then engages the screw, spins it into place, and releases it when it is properly seated. If work is positioned inaccurately, the screw will only wobble about in the catcher without damaging the work, until work is repositioned.

Feed tracks can be adjusted for various size fasteners, and there are sizes of interchangeable catchers and bits for every screw size and shape.

This tool can be operated with a rotating indexing machine, or several units can be set up with an indexing system and controlled by only one operator. When coupled with an indexing system, the tool can drive up to 60 screws a minute.

Another power tool, this one made by Foredom Electric Co., Bethel, Conn., weighs only 5½ ounces; is only 8 inches long. It is designed for regular production on small assemblies requiring screws from size 0 through 4 (slotted and Phillips with flat, round, fillister, binding, pan and truss heads). It also runs nuts through size No. 4. Normal driving torque is 28-32 inch ounces, with maximum torque being 5 inch pounds. Idling speed is 1150 rpm.

The motor, flexible neoprene shaft and handpiece come with a hang up handle, or on legs to be set on a workbench (approximate cost is $110).

Another interesting unit is a portable hopper fed pneumatic driver which has a self-releasing torque control and can drive almost any type of screw up to 2 inches long. Called Tru-Tork and made by Clyde Engineering and Mfg. Corp., Madison Heights, Mich., the tool is used by manufacturers of truck trailers, automobiles, furniture, television sets, etc.

In operation, this unit utilizes a hopper, a plastic feed hose and a pistol type driver. When the operator pulls the trigger, a screw is driven into the work. Another screw shoots through the plastic tube to the nose of the gun an instant after the driven screw is set at its predetermined torque, while a third screw enters the tube from the hopper.

An interesting accessory supplied by Black and Decker Manufacturing Co., Towson 4, Md., is a special bench stand that will accommodate the various B & D pistol grip Scruguns.

When the Scrugun is clamped firmly into place in the bench stand, it is operated in much the same manner as a drill press. This combination of tooling is recommended for heavy duty driving in which accuracy is particularly important.

Black and Decker builds a wide range of fastening tools — pistol grip or center drive, with or without adjustable clutch. Another B & D product is its Power Speed Control which gives control of torque on one or more adjustable clutch Scruguns.

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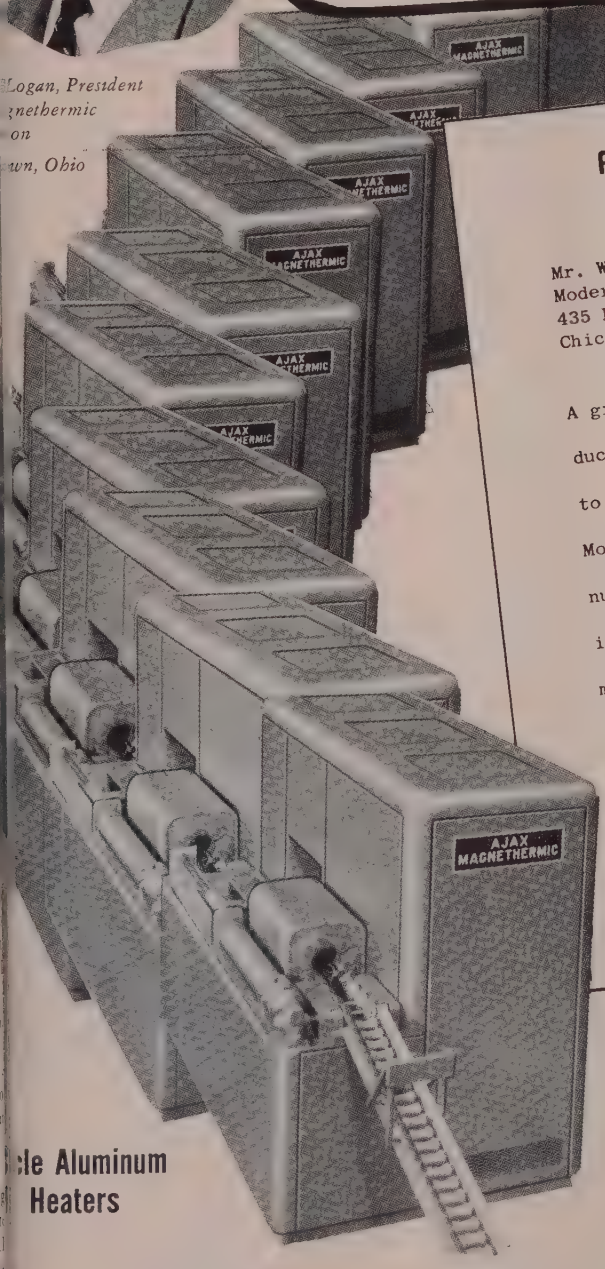
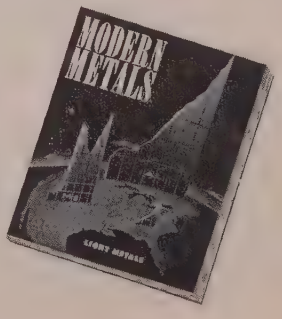


cle Aluminum Heaters



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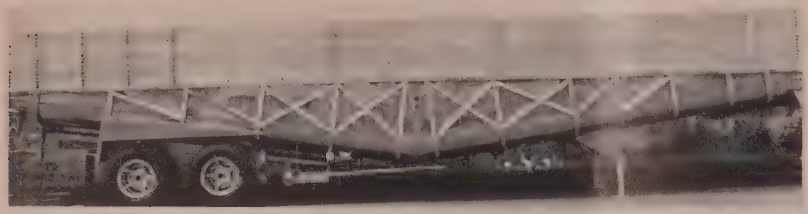


Dual Cargo Trailer Packs Big Payload

Both liquid and dry cargo payloads can be carried in this new all-aluminum trailer, designed and built by Standard Steel Works, Inc., North Kansas City, Mo.

One way or the other, the load would be 42,600 pounds; the underslung aluminum tank can carry up to 7250 gallons. Cubic content of the dry cargo portion enclosed with 3-foot high side and end boards is 710 cubic feet. Measuring 42 feet in length, the tandem axle trailer stands 10 feet high and weighs 10,715 pounds empty.

Harl Day, president of Standard Steel Works, said that the new trailer was originally designed and developed in collaboration with W. L. Lemmon of the Lemmon Transport Co., Inc., Marion, Va. The trailer is being used to carry liquid products on the outbound trip and return with coal, lumber, produce, or packaged freight.

Day also pointed out the trailer can be adapted to suit most carriers' two-way movement of commodities, and that any trucker who has both liquid and dry cargo authority would be a potential customer.

Made of sheet and extrusions supplied by Kaiser Aluminum, the trailer features a rectangular tank extending the length of the unit with the bottom sloping downward from each end toward the center. Interior bulkheads separate the tank into four compartments.

The flat tank top measuring 7 feet, 3 inches wide serves as the top side dry cargo floor. The dry cargo area enclosed by removable extruded 10[illegible] inch long side boards and hinged tail gate, may be increased by using side boards 5 feet, 6 inches high. The entire unit will then measure the full legal height of 12 feet, 6 inches. High-strength 5454 and 6061 aluminum alloys were used and components were MIG welded with 5356 filler wire.

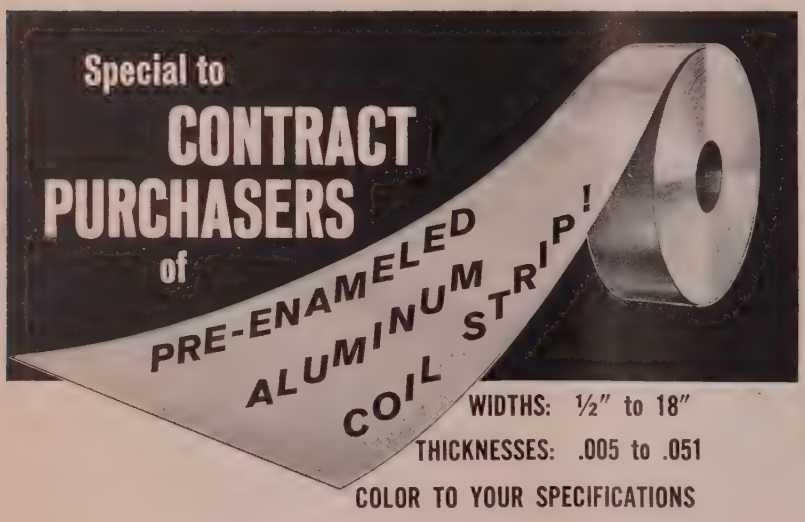
Combination Heater-Cooler Sheathed in Aluminum

A completely self-contained roof-top cooling unit and a combined heating and cooling unit for office, stores, and other single level commercial building has been developed by the Curtis Mfg. Co., 1905 Kienlen Ave., St. Louis, Mo.

The cooling system is available as a separate unit while the year-round temperature control system is a three part package consisting of an air cooled condenser unit, a cooling section, and a gas fired unit for heating. Models are available in 7½ and 10 ton sizes.

The roof-top system requires only one opening through the roof for combination supply and return air duct. No other ductwork or refrigeration piping is required.

The packaged unit is enclosed in a weatherproof housing of heavy gauge embossed aluminum sheet. Exterior painting is not required.



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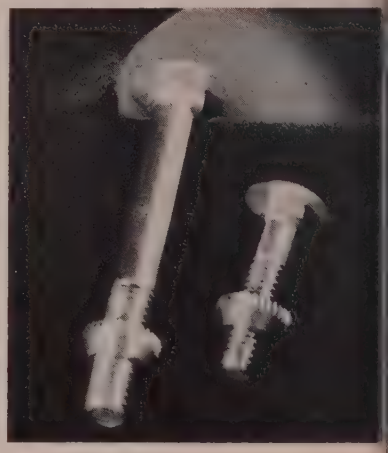


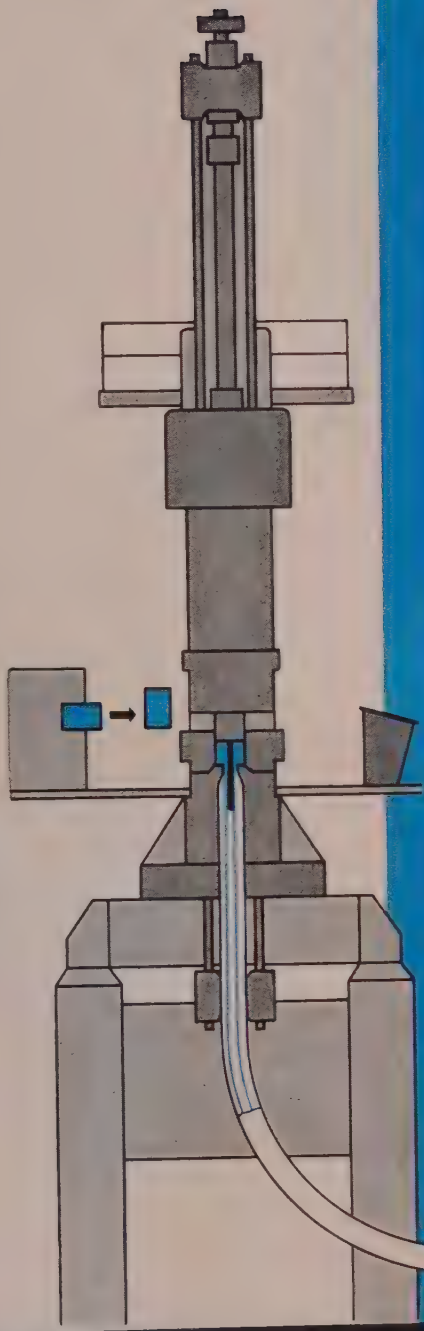
Pilfer-Proof Fasteners Made for Highway Signs

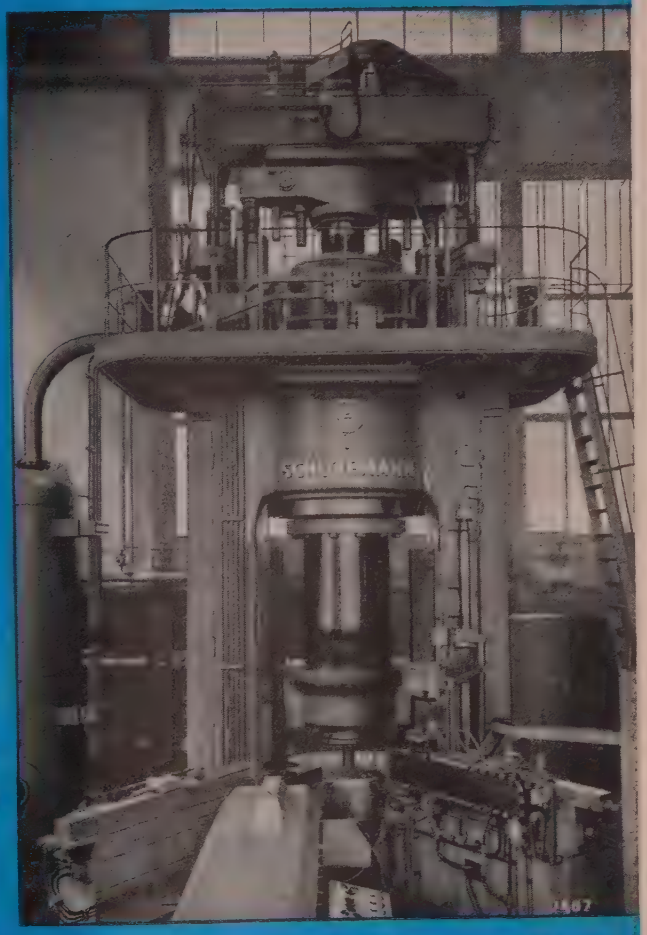
Delinquents armed with a wrench and a pair of pliers will be hard-pressed trying to steal highway signs held in place with a "tamper-resistant" fastener (shown above) made by Aluminum Co. of America, Pittsburgh 19.

The square-shouldered bolt seats itself securely into the round bolt hole of a sign, and is then snugged into place with a coneshaped nut. Since the nut can be removed only with a special wrench, they defy pilferers, says Alcoa. The bolts come in two sizes.

SCHLOEMANN

Extrusion Presses Automated





The fully automatic operating cycle of this vertical 1,375-ton tube and rod extrusion press also includes: billet charging, heating and removing the dummy, as well as the scavenging block; severing the butt, cutting and ejecting the extruded product; cooling mandrel, container, and die. Essential features of the press are covered by patents. Only one operator required. 2) vertical SCHLOEMANN extrusion presses equipped for manual or electro-hydraulic automatic control have been built within the past nine years. Latest SCHLOEMANN horizontal extrusion presses also feature fully automatic operating cycle.

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Even tough EPOXY FINISHES peel off in Oakite STRIPPER S-A

Burn off an epoxy finish from a reject as a last resort? Not at all necessary. Oakite STRIPPER S-A strips metals clean. That's true for multiple coats as well as single coat epoxy finishes. Look at STRIPPER S-A's record:

- *A 3/16" thick coating built up from layers of epoxy coating and wrappings of fiber glass was stripped from gun barrels by overnight soak in Stripper S-A. Everything tried previously had failed.*
- *Brass plated steel parts were stripped of their epoxy finish in matter of minutes.*
- *Workholding spindles and racks laden with at least 10 coats were stripped to bare metal by a short soak. Paint hooks formerly burned clean are now soaked clean instead.*

This powerful stripper is safe for all metals except zinc and magnesium. And it's safe to the user, since it works cold . . . has no flash point . . . rinses with water.

STRIPPER S-A is but one of a long list of superior strippers by Oakite. Some are specially formulated for use on steel . . . aluminum . . . other metals. Some for removing lacquers . . . tough synthetic finishes. Still others are designed especially for removing paint from vertical surfaces. Whatever your paint-stripping problem—Oakite is bound to have the answer. Ask your local Oakite man or send for paint-stripping bulletin F-7893. Oakite Products, Inc., 34E Rector Street, New York 6, N. Y.

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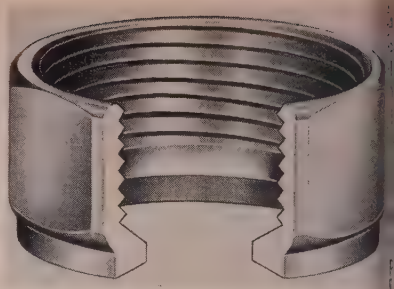


Impact Extruded Fasteners Produced by Eastern Firm

Compression nuts are being impac extruded on new equipment recentl installed by the Jacobson Nut Mfg Corp., Box 177, Kenilworth, N. J.

The firm reports that this item is th first of a series of their products to b impact extruded rather than manufac tured by conventional screw machin and die casting techniques.

The compression nuts are available in aluminum, brass, steel and stainles steel in all finishes and a full range o commercial sizes.

Kaiser Buys Kawneer, Big Building Products Firm

In an effort to get closer to the build ing products field, Kaiser Aluminun and Chemical Co., Oakland, Calif., will through a merger agreement, absor Kawneer Co. of Niles, Mich., one o the country's largest manufacturers o curtain walls, doors, entrances, stor fronts and other architectural product

Awareness of two obvious facts cause Kaiser's move: 27.5% of all aluminur consumed goes into building product Aluminum Co. of America and Rey nolds Metals Co. are prominent in thi industry.

The merger has been approved by th board of directors of both firms, and soon to be submitted to their stock holders.

Under the agreement, Kawneer wi be merged into Kaiser, who will issu approximately $30-million present ma ket value of equity securities in ex change for the 938,263 outstandin shares of Kawneer common stock. Kaw neer does not have any preferred stoc outstanding and long-term deb amounts to only $2,911,000, to be re tired as part of the arrangement.

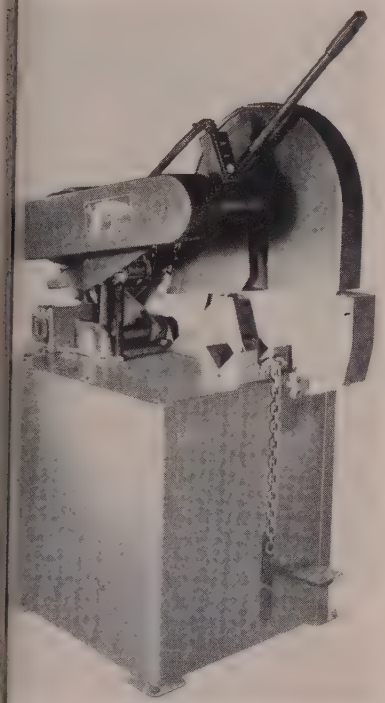
Kawneer stockholders will receiv one-half of common stock and on tenth share of $100 par value 4¾% convertible perference stock of Kaise for each share of Kawneer stock— total of 469,132 shares of common stoc and 93,827 shares of preference stoc of Kaiser Aluminum.

Kawneer, founded in 1907, last yea had record net sales of more than $2 million. This followed a major expan

of facilities in 1959, and the liqui-
n of its Aircraft Division, which
ecome a drag on profits.

A. Rhoades, president of Kaiser, Kawneer will become an operating ion. Kawneer president Lawrence lym and his present management p will head Kawneer Division. is also slated for membership on board of directors of Kaiser Alu-um.

awneer has eight manufacturing ts: Two at Niles, one each at Rich-d, Calif., St. Charles, Ill., South d, Ind., Cynthiana, Ky., Kalama-Mich., and Toronto, Canada. Ware-ses are located in Boston, Atlanta, mi, Cleveland, Chicago, Dallas, Los eles and Carlstadt, N. J. The firm, ddition to direct contact work, sells 100 dealers in the U. S. and Canada. aiser's total net sales in 1960 were roximately $406,600,000.



reater Cutting Capacity r New Abrasive Machine

A dry oscillating abrasive cutting ma-ine is the newest addition to the eed-Cut line of cutting equipment ade by the Abrasive Machine Div'n of aver Pipe Tools, Inc., Warren, Ohio. With the oscillating feature, the new achine (illustrated) provides the user th greater cutting capacity, the Div'n ports. It will cut up to 4-inch solids d most 6-inch shapes. A 20 hp motor ovides the power to cut at the rate 3 to 4 seconds per square inch.

The new Beaver dry oscillating abra-ve cutting machine is available with r-operated power head which accord-

ALUMINUM ATOM. THE 13 ELECTRONS ARE DRAWN AT THE PROPER SCALE IN DISTANCE FROM THE NUCLEUS, ACCORDING TO THEIR ENERGY LEVELS.

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Sales Representatives throughout the United States

ing to the Div'n increases wheel life at least 30% and provides complete uniformity of cut.

Speed Cut Abrasive Div'n also recently introduced a new cutoff called the Speed-Cut No. 11. This machine is said to have application in either small shops or big plants. It cuts up to 3-inch shapes and 1½-inch solids; it uses an 11-inch diameter wheel with a 1-inch bore and is equipped with drive pins.

A screw type positive clamping vise holds work securely while being cut; weighs 136 pounds, stands 21½ inches high, and can be mounted on a stand or on a workbench.

New Desmutter Has Special Features

A new aluminum desmutter, said to be effective on "problem" alloys as well as others has been developed by The Diversey Corp., 1820 W. Roscoe St., Chicago.

The compound, designated Diversey No. 596, may be used for desmutting all aluminum alloys, and for preparing aluminum that is to receive a conversion coating, etching, bright dip or anodizing. It is particularly effective on alloy 6061, Diversey said.

The new product is a light yellow, granular material that is free-flowing, readily soluble and non caking under normal storage conditions. Packaged in a fiber drum, net weight is 175 pounds.

Field experience reported by Diversey indicates that four to six ounces per gallon of Diversey 596 with 5% (by volume) sulfuric acid is completely satisfactory for most aluminum alloys including 2024 and 6061. Higher concentrations are used only for particularly troublesome alloys or when maximum desmutting speed is essential.

Diversey 596 is recommended for use with the company's new conversion coating, Divercoat 2A.

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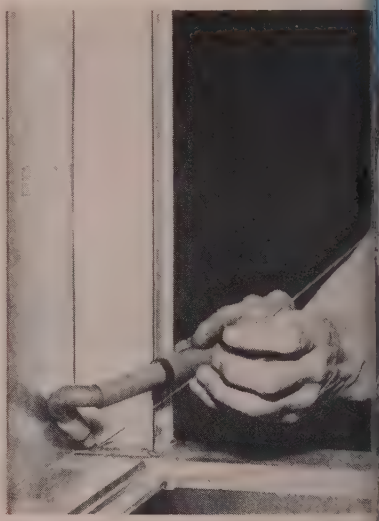


Adjustable Welding Torch Reaches Hidden Corners

A unique tungsten-inert-gas (TIG) welding torch with a flexible body that can be hand-adjusted to any angle as well as extended to reach into difficult recesses eliminates the need for many torches of varying head angles, styles and sizes says Falstrom Co., 147 Falstrom Court, Passaic, N. J.

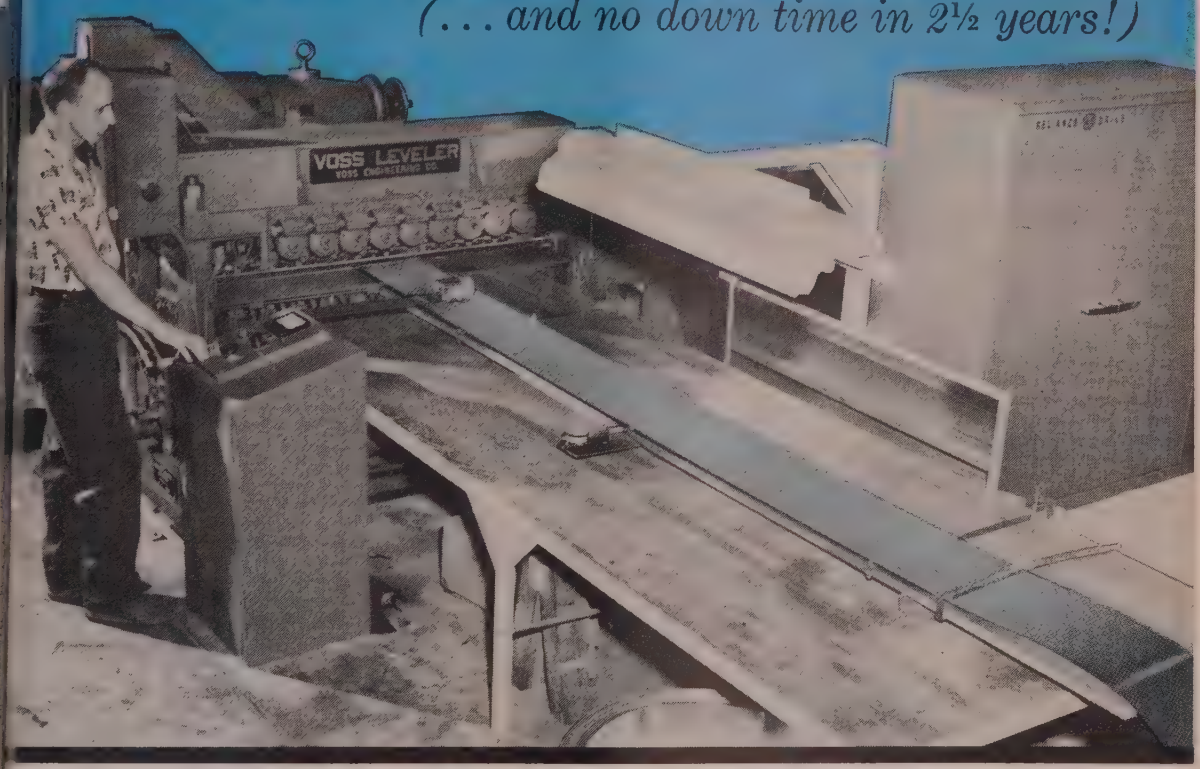
Falstrom fabricates cabinets of aluminum and other metals, and was suffering from slow production due to the time needed to weld interior corners and joints. Various torch styles had to be tried until one was found to fit the special application. The firm decided to develop a single torch which could be adapted to any joint.

The resulting torch, shown above welding a normally difficult-to-reach corner, has many advantages, the firm claims. It says welds are better because the weldor always uses the correct torch angle, faster because only one torch is needed for all operations, and inexpensive because inventory of torch and head styles is eliminated.

The Falstrom Controlled Angle Torch now available is water-cooled and rated at 180 amps (a-c, d-c), continuous duty 300 amps intermittent duty.

DEAD FLAT ALUMINUM STRIP... UP TO 150,000 POUNDS DAILY— ON VOSS ROLLER LEVELERS

(... and no down time in 2½ years!)



One of two Voss Levelers in operation at the Lancaster, Pa., plant of Quaker State Metals Co.

sk Quaker State Metals Company, a leading supplier aluminum to siding manufacturers. Quaker State puts l their aluminum siding stock through Voss Levelers, ecause *only Voss gives them the absolute flatness their ustomers demand.*

Quaker State's first Voss Leveler was installed 2½ ears ago, the second one a year later. Both have with- ood long periods of 24-hour operation, leveling up to 5,000 lbs. per machine daily . . . with no downtime nce installation!

Voss Levelers will solve almost any leveling problem *. . . at high production speeds.* Patented features make possible accuracy and flatness unheard of with any other leveler, *equalling or exceeding stretcher-level flatness in* many cases. Voss Levelers are now in use in steel, aluminum and other non-ferrous plants, in applications ranging from heavy plate to cold-rolled strip, galvanizing lines, aluminum sheets and many others. Let Voss put its years of experience to work for you. Call or Write today.

VOSS ENGINEERING CO.

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Special Cabinets Use Unique, Channeled Extrusions

Pictured above is a unique aluminum extrusion, not a length of slit plate as might be imagined at first glance. The inset shows the 24 internal parallel passage-ways contained in the sections, pronounced a metalworking "first" by Aluminum Co. of America. Alcoa produced the extrusion at its Lafayette, Ind. plant for Naval Avionics of Indianapolis, Ind.

Each opening measures ½-inch at its widest point, 3/16-inch high; they are spaced ¼-inch apart in the 18½-inch width and extend the full 65-foot length of the panel. The intricate, precisely made parts were produced in alloy 6063 and will be used to form cabinets that will house electronic equipment in high altitude aircraft. Cool air flowing through the 24 channels will maintain the equipment at optimum operating temperatures.

Alcoa extruded the unusual pieces on a 14,000-ton press, using a special bridge type die.

"The panels or similar extruded parts could find extensive use in many industries where flowing gases or liquids are required to overcome heating and cooling problems," Alcoa said.

New Roll Coater Plant Set for April Occupancy

A million dollar building and retooling installation is nearing completion at the Greenfield, Ind., site of Roll Coater, Inc. Occupancy is slated for April, when the entire operation now located at Pendleton will be moved to the new site.

Complete manufacturing of a line of pre-painted home improvement products will be carried on in the plant in addition to roll-coating operations. A 42-inch, 400-foot continuous metal coating operation which will clean, treat, coat and bake on synthetic enamel will be housed by the new facility.

The city of Greenfield, 15 miles from Indianapolis, solicited the Roll Coater operation. The city-owned electric and water utilities will expand almost 2 miles to meet the company's requirements, and the Greenfield Airport is building a runway suitable for air cargo.

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Now available: 36-page reprint . . . all about finishing aluminum

All seven major editorial features from the September 1959 issue of Modern Metals have been brought together in one useful and interesting booklet (see table of contents below). To order copies, simply fill in order form below and return it, with payment, to Modern Metals, 435 N. Michigan Ave., Chicago 11

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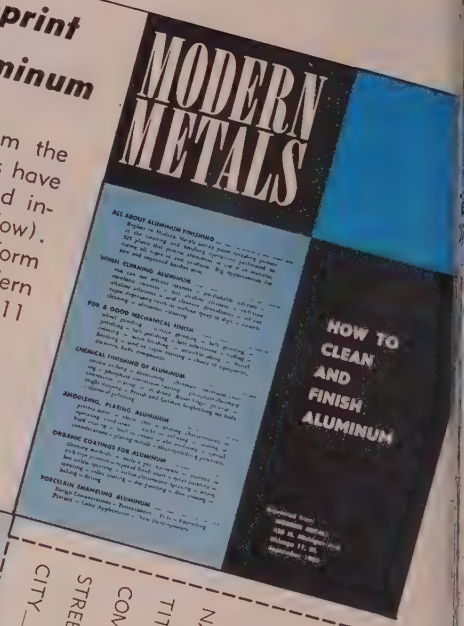

ALL ABOUT ALUMINUM FINISHING
Replies to Modern Metals survey paint revealing picture of the cleaning and finishing operations performed by 327 plants that process aluminum or use it in manufacturing all types of end products. Big opportunities for new and improved finishes seen.

WHEN CLEANING ALUMINUM
you can use solvent cleaners — emulsifiable solvents — emulsion cleaners — hot alkaline cleaners — etch-type alkaline solutions — acid cleaners (deoxidizers) — solvent vapor degreasing (with or without spray or dip) — electro-cleaning — ultrasonic cleaning.

FOR A GOOD MECHANICAL FINISH
wheel grinding — surface grinding — belt grinding — polishing — belt polishing — belt lubrication — buffing — coloring — satin finishing — scratchbrushing — barrel finishing — sand or vapor blasting — choice of equipment, abrasives, buffs, compounds.

CHEMICAL FINISHING OF ALUMINUM
caustic etching — desmutting — chromate conversion coating — phosphate-chromate conversion coating — phosphate conversion coating — modified Bauer-Vogel process — bright dipping — British and German brightening methods — chemical polishing.

ANODIZING, PLATING ALUMINUM
pretreatment — electrolytes — coating characteristics — operating conditions — racks — coloring — sealing — hard coating — built-in colors — electroplating — special considerations — plating metals — electroplating processes.

ORGANIC COATINGS FOR ALUMINUM
cleaning methods — surface pretreatments — primers — etch type primers — types of finish coats — spray painting — hot airless spraying — airless electrostatic spraying — steam spraying — roller coating — dip painting — flow coating — baking — drying.

PORCELAIN ENAMELING ALUMINUM
Design Considerations — Pretreatment — Frits — Enameling Practice — Color Applications — New Developments.

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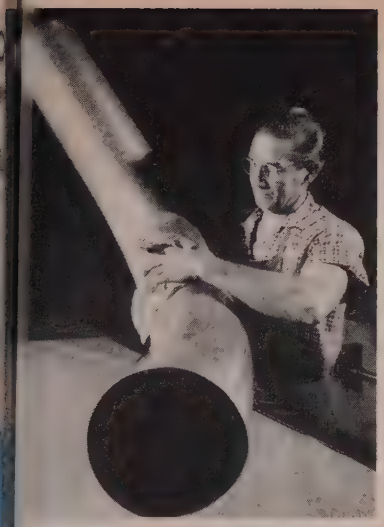

chnique for Bending Big ameter Tube Developed

method of bending 8-inch O.D., thin-wall aluminum tubing with end radius of 2.5D has been perfect- at Boeing Airplane Co.'s Wichita, ., Division. Boeing said the method n "industrial first."

Use of 8-inch aluminum tubing for raft had not been possible before ing developed this technique. Tool- is now being completed to provide bend radius capability on .044 erial. Boeing people are certain the d radius can be reduced to 1.5D heavier wall material.

irst efforts toward this simpler, cost- ng production method began with design of a ram-air system for the 2H. It was doubted that 8-inch wn tubing could be used because of thin-wall, center-line radius, wrin- ng, tooling and other problems.

After working out most of the major blems, Alcoa agreed that it could duce the big tube to Boeing's specs, hough this size had never been made aircraft quality. A short time after necessary material was provided Alcoa, the new missile bomber duct s in production.

'In bending the 8-inch, thin-walled e, we used a Pines bending machine t had been modified to accommodate s diameter," a Boeing man said. egular tube bending tools were used h as wiper die, clamp block, bend- ; die and a ball jointed mandrel.

'The first tube bent was formed to degrees on a 21-inch centerline lius. Tools are now being made to m an 8-inch diameter tube to 90 grees on a 16-inch centerline radius." Boeing said there are indications that 044 wall tube will probably be the nnest wall they can successfully form 90 degrees on a 16-inch centerline lius.

"The thin-out in outside bend area s less than 20%," Boeing reported.

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Pfister is noted for its exceptionally bright finishes and consistent high quality. At *Pfister* great care goes into each customer's order.

In keeping with its policy of tailoring tubing to your every need, *Pfister* offers a wide variety of fabricating facilities. Not only can you be sure of the finest quality and a range of services from *Pfister*, but you can count on fast delivery, too!

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Men-on-the-move

Alloys & Chemicals Corp., Cleveland, aluminum smelter, has appointed **Thomas H. Ginsburg** vice president-plant manager, and **Alfred S. Dubinsky** vice president-raw material purchasing. Ginsburg joined Alloys & Chemicals in 1957 after having served in managerial posts at other smelting firms.

James R. Dissette has been appointed manager of Bohn Aluminum & Brass Corp.'s Plant No. 12, South Haven, Mich. He succeeded **Edward N. Harris,** who was recently named vice president.

Stockholders of A. M. Castle & Co., aluminum and steel distributors of Franklin Park, Ill., elected **John M. Simpson,** former president, chairman of the board. **Robert J. Heggie,** formerly vice president and general manager, was elected president; and **Norman L. Jones** and **Andrew J. Kemp** were named vice presidents.

W. L. Van Winkle has been named sales manager of the small diameter rolls manufacturing division of Voss Engineering of Pittsburgh. He is a metallurgist, graduate of the University of Michigan with extensive experience in the roll manufacturing field.

Quaker State Metals Co., a division of Howe Sound Co., has appointed **Edward W. Guion** assistant manager of fabricated products. He has been associated with Quaker State since his graduation from Penn State University.

J. B. Hobbs, Jr., has been appointed general products manager of Precision Steel Warehouse, Inc., Franklin Park, Ill., processor and distributor of aluminum, copper base alloys, low carbon and spring steels and stainless strip.

Wyman-Gordon Co., Worcester, Mass., a leading manufacturer of light and heavy forgings, has named **Arnold J. Rustay** vice president. Technical director of the company since 1957, Rustay is widely known in metallurgical circles as a writer on forging techniques.

To lend emphasis to the new importance of aluminum chain link fence, Nichols Wire & Aluminum Co., Davenport, Ia., has named **Ralph Getzin** its first product manager. Getzin comes to Nichols from the Realock Fence Division of Colorado Fuel & Iron Corp.

Nick W. Cox has been appointed sales representative of Aluminum & Magnesium Inc., Sandusky, Ohio. He will be responsible for all sales throughout Wisconsin as well as the Chicago-Minneapolis-St. Paul area for this smelting firm. Aluminum & Magnesium Inc. also has a plant at Corona, Calif.

Copper & Brass Sales, Inc., 31-year-old nonferrous metals distributor, has named **John F. Lepine, Jr.,** vice president in charge of sales and advertising. **Verne E. Mounteer** becomes vice president in charge of the Cleveland, Ohio plant.

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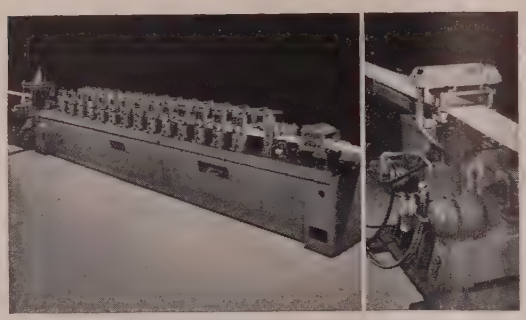

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ed aluminum discs which hold the
r rungs away from the wall for
grasping. Overall width of the
r is about 15 inches. Total weight
16-foot length, standard for use
two-story home, is about 7 pounds.
e Marlan ladder is made by Mary-
ane & Co., Inc., 234 Godwin Ave.,
son, N. J.

e handy escape device stores com-
y in a box smaller than a child's
hest and can double as a bench or
mp stand. It is said to have the
oval of the U. S. Navy who have
it on various Antarctic expeditions.

Financial Briefs

vey Aluminum Sales Up; orts Promising Outlook '61

Harvey Aluminum ended its 1960 fis-
ear September 30th with a net prof-
$5,007,837. This compares with a
profit of $4,480,535 for 1959. Net
for the fiscal year were $59,681,142,
pared with '59 sales of $60,885,656.
rence A. Harvey, board chairman,
ted out that the net earnings were
lespite this sales differential by rea-
of close supervision of operating,
ng, general, and administrative ex-
ditures in a period of rising costs
increased competition.

he first quarter of fiscal '61 con-
ed the upward trend. Sales of $18,-
233 netted $1,189,079, equal to 25
s a share. For the like period in
the net was $971,401, or 20 cents
are on sales of $14,699,846, based
4,750,000 shares outstanding.

rnolds Reports 1960 Sales, nings Decline From 1959

Net profits of Reynolds Metals Co.
its subsidiaries in 1960 amounted
$25,661,000, after provision for in-
e taxes of $11,758,000. This profit
qual to $1.26 per share on 17,038,195
es of common stock outstanding. In
9 the company had a net profit of
,634,000 which was equal to $2.39,
the basis of the same number of
standing shares. Income tax provi
in '59 was $30,101,000. Last year
sales were $438,724,000, compared
h $489,263,000 in 1959.

in Aluminum Reaches eak-Even Point for First Time

Net sales of Olin Mathieson Chemical
p. last year were the second highest
the corporation's history, totaling
9,623,000; and if its aluminum oper-
ons made no real contribution to the
,669,000 in profits, their adverse ef-
t can be said to have ended;
y reached the break-even point for
first time during the last quarter of 1960, the company reports. These operations absorbed heavy charges, equal to 26 cents a share, for accelerated amortization of Olin's primary aluminum affiliate, Ormet Corp.

1960 Foreign Sales Balm for Bruised Alcoa

Foreign sales were a considerable comfort to Aluminum Co. of America during a disappointing sales year at home, as indicated by comparative tax figures for 1960 and 1959 in the company's preliminary statement for last year.

Sales and operating revenues totaled $861,211,772 for 1960, compared with $858,460,213 for the preceding year. In 1960 net earnings after taxes were expected to be $40,044,105, compared with $55,570,854 for '59.

Kaiser Made Slight Earnings Gain in 1960

Kaiser Aluminum & Chemical Corp., in its formal annual report for 1960, reported net earnings of $22,771,000, compared with $22,328,000 for 1959.

The increase was achieved despite a 7% decrease in total sales. The corporation's 1960 sales amounted to $406,574,000, compared with $435,550,000 in 1959.

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MIG vs. TIG—relative cost, versatility, weld quality, etc. of these two main aluminum welding processes.

RESISTANCE WELDING—types of machines, electrodes, cleaning methods, etc. for spot, seam, flash welding.

OXY-GAS & METAL ARC METHODS—how to choose flux, filler etc.; jigging; flame control; current control, etc.

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(See article, page 32, this issue.)

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3-61

perative Hot Roll Mill Be Built Near Oswego

site near Oswego, N. Y., has been ed as the location of the aluminum olling mill to be built and owned ly by Aluminium Limited, Bridge- Brass Co., Cerro Corp., (Fairmont ninum Co.) and the Scovill Mfg. See MM, Nov. '60, p. 30.)

ne new plant will produce alumi- reroll stock which will be pur- ed by the four owners for further cation at their sheet mills.

eaking on behalf of the four com- es, Aluminium Limited reported during the past few months many native areas have been studied. nary considerations in the choice Oswego are its location in relation he plants of the four companies, ss to water, rail and highway trans- ation, as well as the availability of ified workers and adequate power. Engineering of the plant is under- site preparation and actual con- tion will begin within the next months at an estimated total cost $30 million," Limited's spokesman "It is expected that up to 1,000 will be engaged in construction."

rcraft Unloading Stairs sed in Aluminum

Pan American World Airways oper- passenger boarding stairs enclosed aluminum sheet and mounted on a mmercial vehicle chassis. The self- pelled unit, Autostair, is manufac- ed by Edghill Equipment Ltd. of ok, Hampshire, England.

Stairs are of Noral aluminum alloy dplate which has a raised pattern. As soon as an aircraft stops, the ve- le is driven up to it and the stair t raised by controls in the driver's until the top landing is approxi- tely aligned with the passenger exit. gnment of the stair is completed by ush button control providing for fine ustment on the top landing.

Pan American has 18 of these units service throughout the world.

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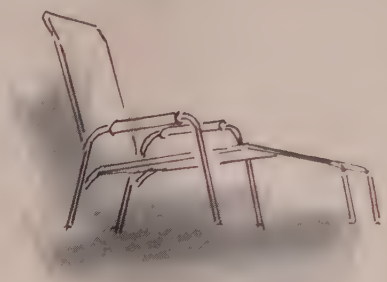

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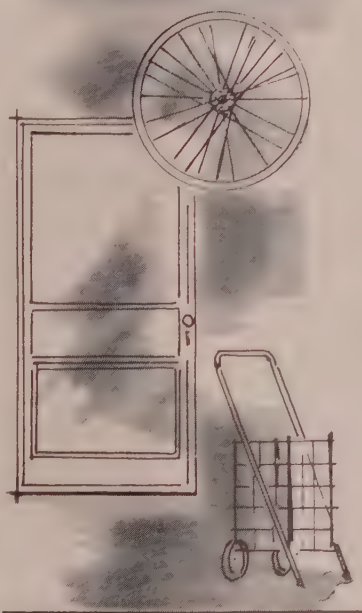

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ON ZINC—Iridite plus Irilac gives longer product life, brighter appearance. Color range—clear Iridite to olive drab, plus colored dyes.

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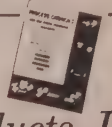

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- **How to specify and Use Standard Threaded Fasteners for Aluminum Products (see pages 62-82, this issue)**
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ooking Ahead

coming of spring hasn't been so welcome in 15 years for most light metals fabricators and product manufacturers. Some buyers are finally coming out of six or eight months of hibernation, and placing orders for not only sheet, extrusions, tube and castings, but metalworking equipment as well. Even the more aggressive machine tool builders are getting inquiries that had been shelved for nearly a year. A still better barometer is that metal distributors are now selling to accounts that had been dead since last fall. Then there's the stock market. These 5-million share days give brokers the impression that people think money is going out of style. The picture on new issues has changed to the point where they can put together old "dog-and-cat" situations and peddle them to small investors who have been out of the market for over a year.

s new switch (if that's what it is) is even felt in the department stores. The big stores are muttering that March business ain't so bad after all. In fact, many a spring clearance sale has been called off because they don't have the inventory they had a month ago. We can also be thankful that non-residential building and heavy construction are 10% ahead of last year. The highway program is up 30% over a year ago, and school construction is some 20% over last year.

so good is current home building. Buyers are waiting for better homes at lower prices — and they aren't getting them. Car sales are sluggish because the buyer doesn't like what's offered; figures he'll hang on to his down-payment money until auto makers come up with something new and better. Much the same is happening in appliances and other consumer goods. Manufacturers seem acutely aware of this sales resistance; are working around the clock to come up with new models by fall.

e big problem is 6 million unemployed, some say. Others yap about imports, the farm problem, or the slowdown in military buying. The problem of lingering unemployment in the face of increased business activity is very real; will remain with us for some time. Last month we suggested a master program for the remodeling of existing structures, big and small — a sort of huge $10 billion face-lifting program that could add a million or more people to the labor force. Despite problems in getting it started, this approach could benefit the entire economy — and without much government pump-priming. It could be as economically significant as the emerging television industry was in the late forties. It's a plan that would need top-level attention and one which wouldn't be easy to get people interested in. It could give the economy a tremendous shot in the arm, but big solutions don't come easy. Hope to have more on this next month.

Both Alcoa and Kaiser Aluminum have sensed an upturn in aluminum sales in the first quarter, and Alcoa expects the trend to continue through the second and third periods. But no change in operating rate is planned by either company. Alcoa has been running at about 73% of rated primary capacity; Kaiser at about 50%. The latter is currently selling more metal than it's producing; expects this to continue until its heavy inventory of metal is trimmed back.

Rising demand for aluminum probably won't show a distinct trend before next month. But there is some stiffening of prices. Sheet mills have pretty much killed the commodity price on aluminum sheet for trailers. Several other commodity items are also getting the hard look. This indicates aluminum mills' determination to boost profit margins; could result in moves to return to published prices.

Last year the fastener industry faced its greatest challenge from imports. Prices were so cutthroat that a number of fastener outfits went broke. This year we note a strong merger tendency among them. In compiling data on the fastening aluminum series (see pages 62 to 82 for part 3), we found one company buying another, then the new combine being gobbled up by still another. This industry has suffered from lack of promotion, and confusion resulting from too many "specials." Some fastener firms were amazed at the volume used by light metals product manufacturers, as revealed by our fastener survey (see January issue, p. 28). But very little "how to" information has been published with respect to aluminum. That's why we're doing this series. We've already had orders for 1500 reprints of the series; will probably get 5000 once the series is completed in April.

Dow is revamping its entire magnesium organization, and it seems to be paying off. In a recent interview, Dow's president, Carl Gerstacker, said that as a result of new applications the magnesium division is now moving into the black after years of red ink. Looks as if magnesium has moved into the auto industry for 1962. AC Sparkplug Division will use die cast magnesium fuel pump housings. Oil filter bases, some instrument parts and backings are also mentioned as possible uses. We hear that a prominent lawnmower manufacturer will use several magnesium castings in a new model.

— The Editors

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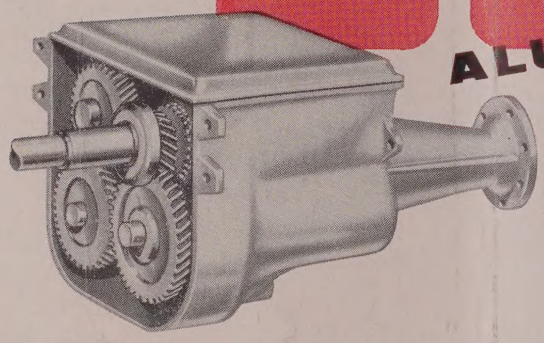

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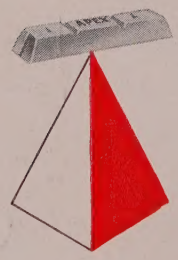

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